

YOURS! A GIFT OF GOLD-EVERY PURCHASE OF 1 CAR POLISH! \$2.25 VALUE

HERE'S THE "BUY" OF THE MONTH!

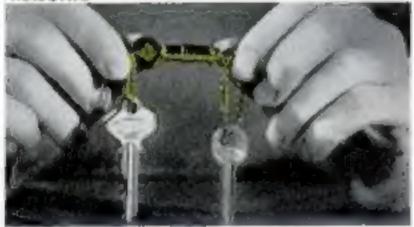
Due to be withdrawn Dec. 31, 1953, so get it now while the gettings good!



What CAR MAC is!

Car Mac is the smartest, handiest key chain you ever saw! It's beautifully gold-plated with an embossed head on which is either the Masonic emblem or a St. Christopher's medal. Take your choice! The key chain has been called the "Policeman's Friend" because it's such a sound protective device! Nobody knows better than police officers and insurance people the loss hazard of walking away from your car and leaving all your personal keys on the one chain. With Car Mac you avoid this risk! One push on Car Mac's plunger and your car key is on its own chain — you walk away from your car with your trunk, dash compartment, house and other valuable keys on their own chain safely stored on your person.

MASONIC



ST. CHRISTOPHER



Here's how CAR MAC works!

Look at the pictures. On the small chain is your ignition key alone, you can find it quickly in the dark! On the larger chain, all your valuable house, office or other keys. When you wish to leave your car in a parking lot for instance, you merely push the little plunger as illustrated and the two groups of keys are separated. You leave your ignition key and take your "other" keys with you. When you return to your car, simply push the plunger back into its socket and they're both locked together again. Truly a time- and labor-saving, safety device! You never have to struggle to get your car key off the old-fashioned key ring!

Golden St. Christopher and Golden Masonic Car-Macs sell all ever the U.S. for \$1. An attractive gift as wellf

Many styles of Car-Macs sold at stores and service stations. Here are some of the most popular models







Standard Chrome 59c

Gold Crest (with initial bar) \$1.00 Golden DeLuxe (teather Covered) \$1.50

DIESEL LIGHT PLANT (Hem 1660) Dissel Man-ter-11-12 kw. 115/230 v. AC single or 3 phase. 1800 rpm direct connect-ed. Electric Self-starting. Engi-

starting. Engi neat power where continuous low-cost, heavy duty service is import-ant, Wt. 1350 lb. lieg, list \$3650.00.

\$1895.00

PORTABLE LIGHT PLANTS

AC Plant 800-700 Watts

-115 v.-80 eye, Fowered
by a raggest 2 hp. easystarting Briggs gas gogine. No wiring necessary hat plug in and operals. Planty of current
for any oil burner, freeser, broader, emergency
lights, els. which require
on to 700 w. Ideal for Civil
Defense, Fire Depts, trailers
and camps. Complete with
Vollmeter and built-te winding to charge 8 v.
auto latteries. Item 24. Wt. 75 lbs. Be prepared if war or storms brock out \$143.50
hood-1306 watt Plant (Item 45) same as
from 24 but with larger generator \$193.50
hood-1700 walt Plant (Item 20-Similar to
stem 24, but has taree times made \$273.50

MASTIR-LITE 2500 West Plant PUSH BUTTON START

MASTER-LITE 2500 West PLANT 110/120 v. 60 eye. AC. A powerful plant, ruggedly constructed and yet designed for easy portability. Can be started by rope or builty. In 12 v. electric push bulbon starte. er, Built-in wind-ing to charge bat-tery, Powered by a big 5.10 livings so-gine, complete with

HI-LINE 6000 WATT PLANT

(Item 102) Push sotton
Start, 115-230 v. 50 syste
AC, A brute of a power plant
with a rugged 14 up, Wisrecognic engine. Flenty of elecfricity for ranges, water
beaters, freezers,
pumps, userhinery,
etc. Affords both
110 and 220 voits,
lical where heavy wt. 500 to . Ess-ily worth \$695.00. With self starter, far tory \$645.00

but with Crash Start (Item 160). \$585.00 Generator and central box only, belt driven. Use your own engine or tractor. WL \$345.00 240 lbs. (Item 163) Factory price \$345.00 We make fully automatic controls to operate any of above light plants. Write for details. We make all piece up to 25,000 Watta-Write.

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Hig and rugged stationary compressor provides A c.f.m. - pients of air for industrial uses, pre-seed by heavy duty repulsion induc-tion 5% HP, 115/230 motor. Factory cylinder





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1 TON MASTER HANDEE DUMP Here at last to an all-purpose I to ton dump

anywhere, inside or out for usuling SHAROLINE. annd, gravel, dirt, cnal, grain, trash, industrial acrap, etc. Unitadis, tilta, side with one pull of the handle-yet

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FLEXIBLE SHAFT

A precision built, beavy duty tool with accessing flewinity, Replaces a dosen individual bools—drills, buffs, grinde, sands, saws—bandles jobs in impossible places, tits any by shaft on lathe, drill press, grinder molor, spare gas or electric molors, etc. Heavy duty by place wire over enrased to lough rubber housing. Handle and ather equipped with precision ball bearings, rugged industrial type for years of service. Arbor takes all by bore wire wheels, grindetime, etc. by 20 standard threads, Operator on any by by a by he molor.

\$15.95 (Item 240) Wt. 10 fb. Beg. \$29.95

HEATING &

Them 10) Easily installed in furnace pipes, Forces even best to all rooms, Over range removes bitchen somice and olors, Powerful, continuous duta molor, 110-120v. AC, Mount in wall or esting to ventilate any warea, Quiet, super-efficient fan moves hims volume of air, (40c) to 6cc (FM); R Fan, wt. 5 lbs. \$4.85; 9 Fan, wt. 6 lbs. \$7.85; 10 Fan, wt. 7 lbs. \$8.85; 12 Fan, wt. 8 lbs. \$9.80, MEAVY DATY FAN. Semi-eoclosel molor, suitable for spray handles, restaurant on



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Tremendous air movement (1700 CFM) and quiet operation make CFM: and quiet operation make this double inlet 10" turning this welling, drying and air conditioning lides for attic or harn vection, converting gravity best for a forced air array beath as Child.

tog Shear for alise or barn ventilization, converting gravity beating to forced air; spray beating to forced air; spray beather to force and the spray beather to the spray beather to the spray beather to be supported by the spray and belt Dimensions 10° ht s B° x 1615. Outlet opening 13 a 1125". Wt. 45 lbs. Item 245. Reg. 854.50.

Factory Special to spray motion for above \$16.55

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MASTER GARDENER

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PUSHING Tructor **chamb** with Sagar Blow ment

Works for you the year 'round,
Does terrific job of cleaning
snow from walks, drives, etc.
without backbreaking work. Also prepares deep mellowed

weeds, lawns, etc. The Master Gardener performs better - does more than tractors coating twice as much, Con-

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Lo, etc. Basic self-propelled 2 hp \$119.50 irector, lirogra or Citaten engine. \$12.50 Show Blow. \$42.50 Shotary Tiller \$42.50 Cultivator \$8.78 Disc Marrow. \$13.78 Furrowing Tool \$4.75 Flow \$18.00 Sichis Har Mower. \$42.50 Lawn Mower Hilch recent property to make the control of t reacht precent to most areas. Easy payment

37 Pc. SOCKET SET



Highest quality, guaranteed non-breakable sochets made by Husky, Beautifully matched chrome allow, absolutely alloy, absolutely the best. Com-plets range of 17

the best Counties range of IT sockets from to thru the tige drive and 7/10" thru the tige drive and 7/10" thru 1.1/16" thr

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12 Pc. SOCKET SET

(Item 803) Contains a complete set of sechete
in 12" drive, 54" drive and 14" drive, plus
all necessary extensions, bandles, speeders,
reversible ratchets, etc.; all unroad, guaranteed against breakage. Besutiful resiched
chrunted thin wall alloy sockets is a sturdy
bandsome steel loot text, Wt. 17 lbs. 227.65
List Price 862.00, Factory Receis! 27.45

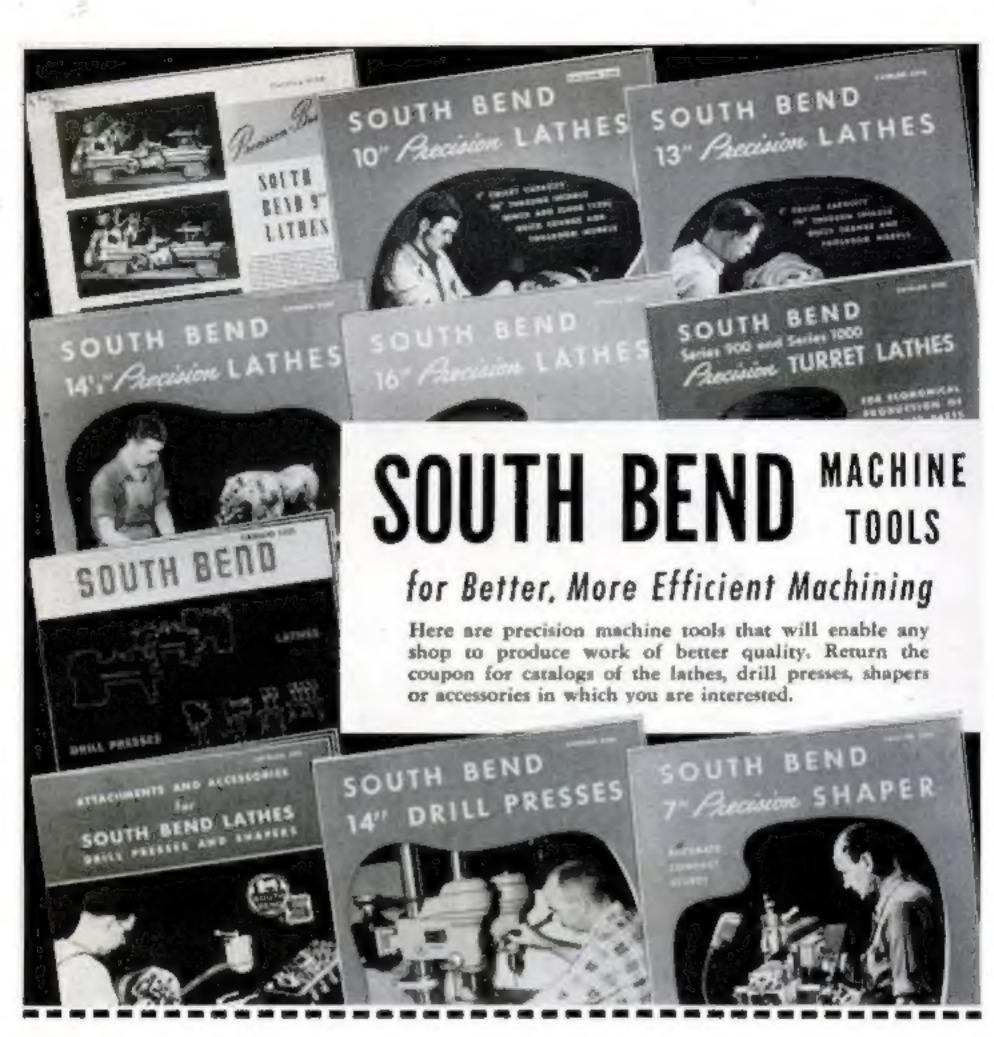
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Use as portable or shop weld-

With mounties as you can't buy a better with irrator, peep or 15 bp. Eas engine, or 7 hp. and triple Y belt or flat puller. Will instructions, peep or 15 bp. Eas engine, or 7 hp. and triple Y belt or flat puller. You can pay mother. Will it is a continuous service. Will be a continuous service. Built-in air cooling system. Are is easy to atrice and hold, because of specialty designed are stabilizer. Hillo a continuous services with instructions, continuous services. But you can't buy a better service. But you can't buy a better service. The built-in dual recostal for low heat \$10.00. built-in dual riscostat for low heat \$119.50 soldering, bratisg, welding. Spec. \$119.50 welding helmet, electrode holder, ground sloed viamp. Sold only with welder at \$10.50 write for prices on A.C. Arc Welders

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How to Run a Drill Press —25¢	City & Zone	Ste	stesouth

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IN SOME WESTERN STATES PLASTICOTE IS SOLD UNDER THE TRADE NAME OF ICU AUTO POLISH

A word about PLASTICOTE!



PLASTICOTE is to automobile polish what jet planes are to airplanes, it's the fastest, hardest, most beautiful finish you can apply. It gives your car that "baked enamel" look that the new sporty foreign cars have! And you can apply it with a simple "smooth-on" application in about 33 minutes — no tough, tiring rubbing! About three applications to a can of PLASTICOTE or three complete polishes to one can for the standard price of \$1.25 — and a can is a year's supply. A PLASTICOTE polish is good for up to six months! PLASTICOTE leaves a tough, flexible, transparent protective coat! Once you PLASTICOTE your car you'll never return to old-fashioned elbow-breaking polishes because PLASTICOTE is the newest last word! Put it on tomorrow and you'll say — "it's quick, sure and easy!" Cleans as it polishes, too!

Here's why PLASTICOTE works better!

The "rock" the man holds in his hand looks like a 500 karal topaz. Notice how its gem-like hardness is peeling up the surface of the cake of wax. The "rock" is a piece of the finest plastic made especially for PLASTICOTE. The wax is the sort you find in ordinary automobile polishes. No wonder PLASTICOTE really puts a finish on a car. Waxes at best are soft, melt in hot weather, and may require abrasives to clean the car which really damage point and you have to work to make them work! Not PLASTICOTE—just s-m-o-o-I-h it on, wipe off and you'll say, "it shines!"



GET THIS TOP GIFT-OFFER OF THE MONTH TODAY!

Go to your service station now! Pay your friendly service man \$1.25—the standard price for the large can of PLASTICOTE (I.C.U. Auto Polish in some Western States). Be sure and ask for a sales slip! Send the sales slip to us with twenty-live cents in stamps to pay for handling and shipping charges! That's all you have to pay. Be sure your name and address is clearly written across face of sales slip. Below write clearly "MASONIC" if you want the Masonic emblem or "ST, CHRISTOPHER" if you want that kind of Car Mac, And within 24 hours from the receipt of your order we'll mail you by parcel past (delivery guaranteed) one gold-plated CAR MAC. This offer expires at midnight December 31, 1953.

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Founded 1872, Vol. 163: No. 3



Mechanics and Handicraft

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Controlled Indian

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WITH [V]-97

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NEXT MONTH . . .

All About the Money Birds



Scads of people all over the country are making money by raising talking birds. We'll give you one guess as to what they are. Yes, that's right—parakeets. These miniature parrots bid fair to become as much a rage as miniature golf was 25 years ago. Want to make money on parakeets? Next month PSM will tell you how.

) +

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Thanks to GOLD BOND Asbestos Sidewall Shingles



"What do you do when your house needs painting so badly that even the neighbors are talking about it? Dip into your savings account and go ahead with the job anyway? It seemed the only answer for me."



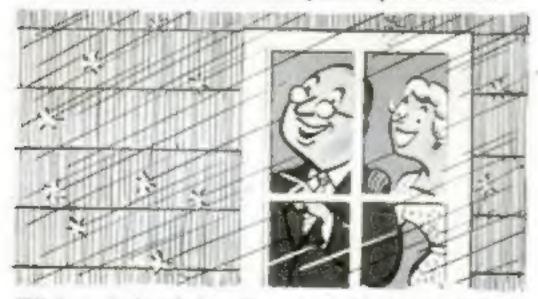
"My friend Joe's house always looked spic and span—like a new coat of paint. 'Paint nothing!' he told me. Those are GOLD BOND Chroma-Tex Asbeston Shingles with new color-protecting Surfascal Finish."



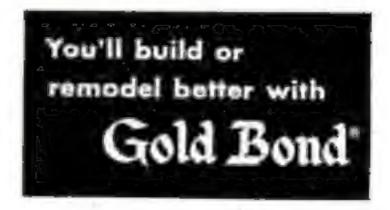
"I went to see my GOLD BOND dealer. He showed me that Chroma-Tex shingles are fireproof...and proof against rot, rodents and termites too. Made of asbestoe-cement... they never wear out, never need paint to preserve them!"



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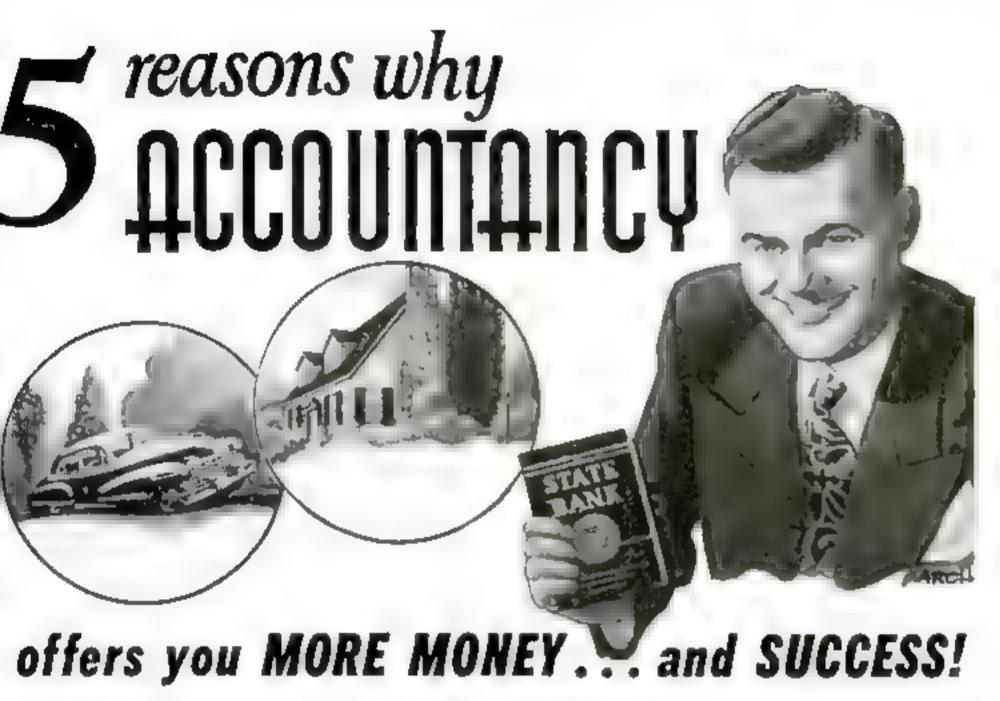


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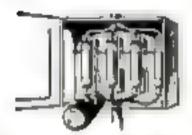
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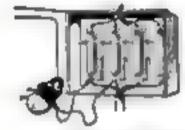
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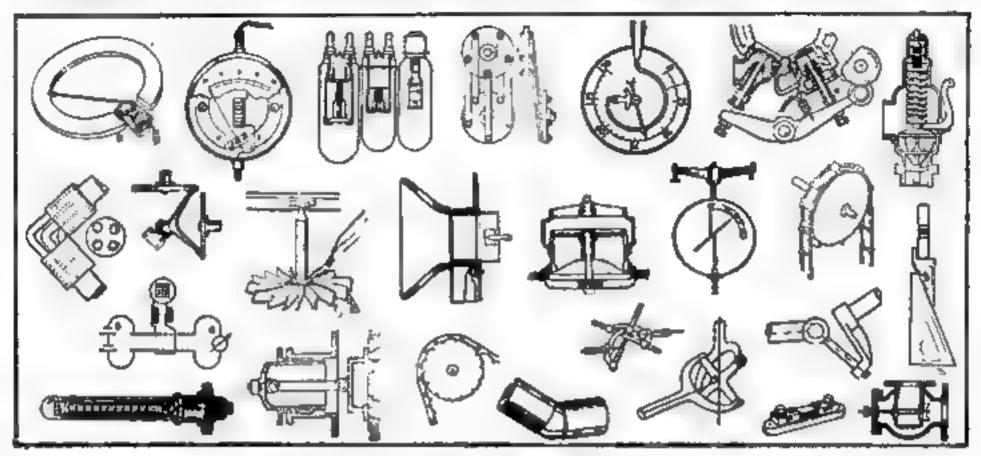
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MODEL "100"	0-100	AMPS AG	0-125/250 YOLT	S AC.

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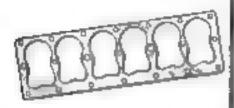
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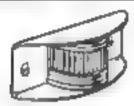
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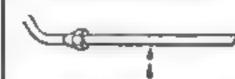
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2 POPULAR SCIENCE

Letters_

Silver Six Feet Down

Your article "What You Can Do with a Snorkel" [July, p. 168] inspired me to buy a piece of tubing and go snorkeling. I found out the hard way at which depths you can breathe. Snorkeling along in Lake Norfolk, I saw a glitter in among the rocks about six feet down. The result was 80 cents in small change (five dimes, a quarter and a nickel). This beats Mr. Sneigr's discovery.

I also found another comforting fact for fresh-water snorkelers. The small pan fish in most little lakes are extremely curious, and more adventurous than that fish mentioned in your article. Two five-inch perch followed me around for about half an hour.



every so often peering in through my mask and occasionally striking it. They then darted off and would loster about two or three inches from the face plate. A most interesting show, to say the least.

STEVEN SANDERS, Flippin, Ark.

All Sat to Go Below

Last winter I tried to make an underwater breathing unit. Though I obtained a great deal of information from the Government, I felt I did not have enough knowhow to build a lung. I think that after reading your July issue I am fully prepared to make a suitable device of the sort I want

I hope to be an engineer after my studies at Rensselaer, and I find that your publication not only keeps me aware of new scien-

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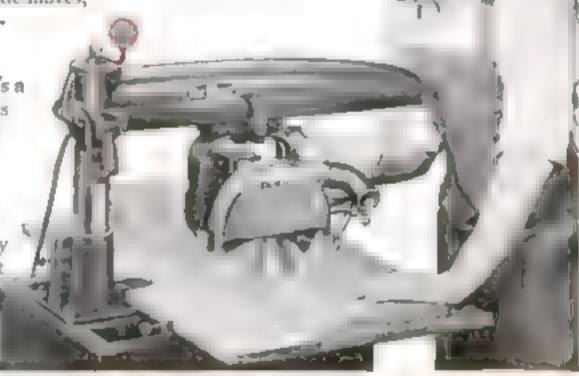
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tific developments and important discoveries but also indicates the many advances yet to come

WILLIAM G. HEATZIC, Newtonville, Mass.

Wrong-way Pump

I hope your article on protecting water pumps with a reset switch [July, p. 159] has not caused very many readers to go wrong. As you show it, the pressure will vary from absolute zero, with the pump running, to the pump cutoff pressure.

RICHARD J. WERNER, Evansville, Ind.

Correct, you are. Contributor Andrew Pfeiffer writes: "The drawing I mailed was in error. The reset switch should go between the pump and motor, not between the motor and well."

Science and Fiction

Let's lay off the pulp stuff ["Islands in the Sky," June, p. 140]. That's for the small boys and the birds,

H. Y. Ballou, Manhattan Beach, Calif.

Let's stick to the 81-year-old policy of featuring actual accomplishments of science. I read POPULAN SCIENCE for facts, not fection.

GEORGE M. EISENBERGER, Washington, D.C.



I enjoyed the June issue very much and thought that the science-fiction story was tops. Keep it up.

RICHARD GERSTEIN, Rego Park, N.Y.

Would you boys like to put on the gloves and settle this issue?

Feel Like Economizing?

Yours has been a most novel approach to advise the motorist how he can conduct his own personal economy run [June, p. 170]. I have an idea that a good many of your readers are going to do exactly that.

ROGER MAREY, Los Angeles.

Now We're in a Museum

Your article on fluorescent ink in the May issue is a MUST for our collection. How

INVENTORS

Learn how to protect your invention. The U. S. Patent Laws provide that any new and useful art, machine, article of manufacture, or composition of matter, or any new and useful improvement thereof, may be patented if the act of invention is involved. Therefore, every inventor with a valuable invention should take advantage of the Patent Laws and proceed for patent protection in order to safeguard his rights.

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Louis Walton Sipley, Director American Museum of Photography Philadelphia, Pa.

Original copy and proofs of "His Magic Makes the World Glow" [May, p. 154] now repose in the American Museum of Photography.

Craves a Rear Burner

Rear engines? I don't think they would handle right in an American car equipped with the usual super-blob tires. But in a wreck give me lots of nice, soft sheet metal



in front of me to soak up the impact, and put the engine in the rear, so it can't come crashing through the fire wall.

DON PROWS, Menlo Park, Calif.

No Sooner Said Than Done

I'd like to know why you don't publish more stories about motorcycles. There must be thousands of your readers who, like me, are fans of this great sport.

WALTER L. AREND, Alajuela, Costa Rica.

Unless the mails to Costa Rica are unusually slow, Reader Arend must by now have read "He's the 'Golden Boy' of Motorcycle Racing" in the August issue, and presumably views us with more favor.

For Drowsy Drivers

I was quite pleased to read the very excellent story on the New Jersey Turnpike in your July issue, but there is one reference in your story which I would like to correct. For some time we have endeavored to keep motorists from pulling off on the shoulder of the road for any purposes other than emergency repairs. If they are drowsy, we urge and require that they use our service areas, which are for that purpose.

You have done a real service to the New Jersey Turnpike and to the welfare of drivers who use our facility and, for that matter, any highway. As Vice-Chairman of the Au-

INVENTORS

If you believe that you have an invention, you should find out how to protect it. The first step is to have a search made of the prior pertinent U. S. patents. If a report on this search indicates that the invention appears patentable you can apply for a patent, and the specifications and claims should be prepared.

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thorsty and on behalf of my colleagues, I extend to POPULAR SCIENCE my thanks and congratulations.

George F. Smith, President Johnson & Johnson, New Brunswick, N.J.

100 M.P.H., and No Fooling!

The boys stationed up here got to gassing about 1953 American stock cars. Will they actually clock 100 miles per hour and over? Pfc. Tim Tomberuin, APO 81, New York.

Wilbur Shaw has clocked over 100 m.p.h. in a new Chrysler, Buck, Olds, Cadillac, Lincoln and Packard. But bear this in mind: all car manufacturers these days are deliberately building errors on the high side into their speedometers in an effort to help trim accidents

We Meant 1,000,000 Watts

In "I Flew with Our Radar Scouts" [June, p. 127], the author refers to a "million-watt, but small and lightweight radar unit." Wouldn't that require a big engine and a big generator?

CHARLES C. FINN, Scattle, Wash.

A radar transmitter loafs most of the time. It may produce 1,000,000 watts of power for one microsecond, then rest 200 microseconds before producing another such burst of power. In this case, the average continuous power produced is only 500 watts, and comes from generators driven by the plane's engines.

How to Handle a Handle

You recently told how to take a broken handle out of a tool [June, p. 217]. Instead of putting that screw in the vise, what's the matter with just putting the handle in?

BERNARD BYRNE, Ruby, N.Y.

Nothing, if the handle were long enough, but the one we should wasn't. It would have been crushed in the vise jaws, if, indeed, there had been enough for the vise to get a grip on. The heavy screw, on the other hand, butes deep into the wood to hold it securely while the tool is driven off.

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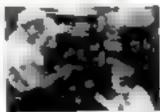
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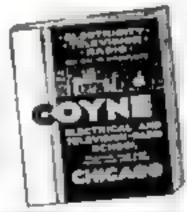
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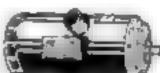
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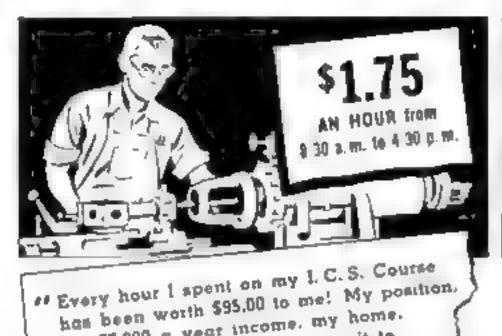


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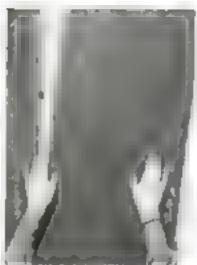
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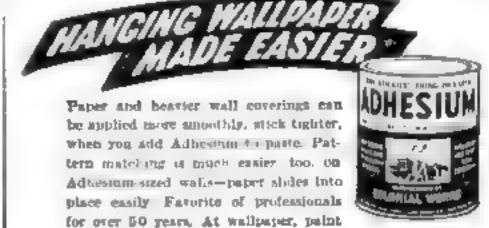


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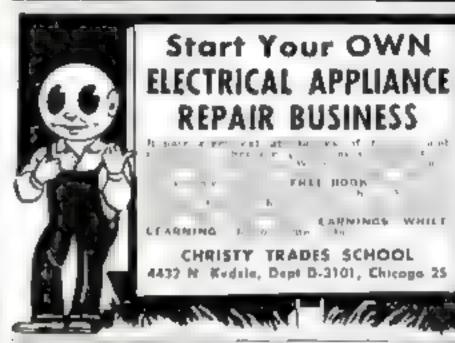
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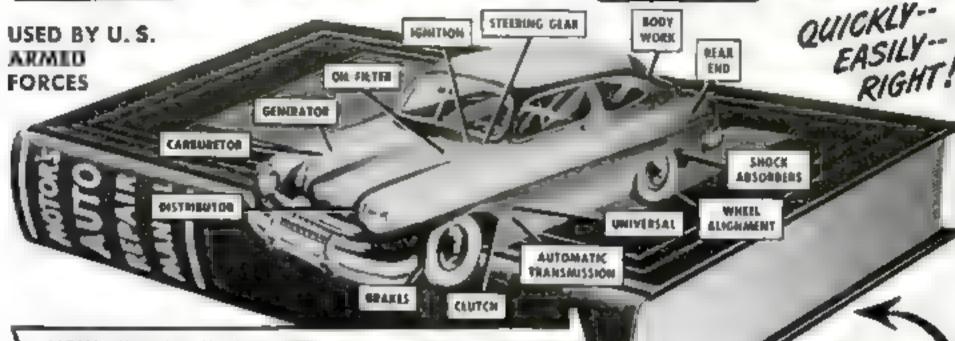
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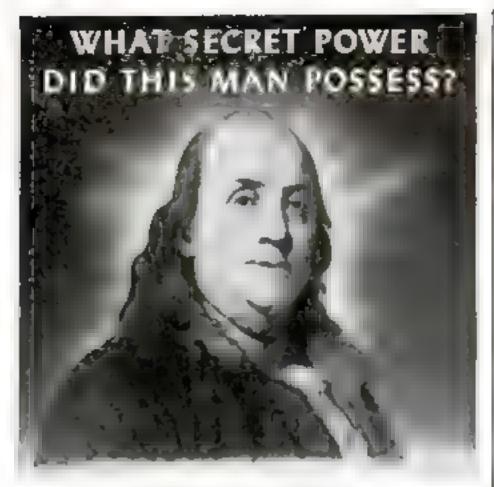


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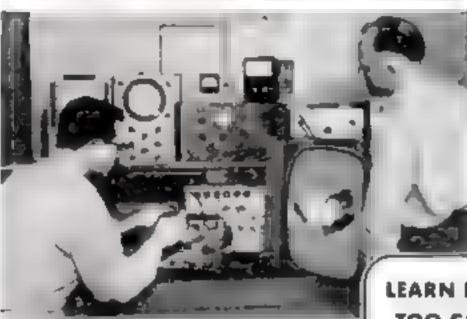
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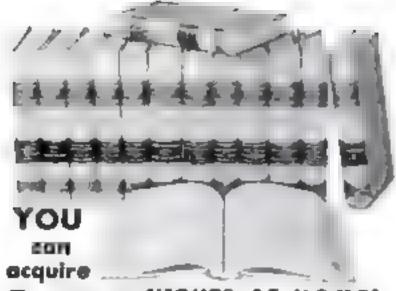
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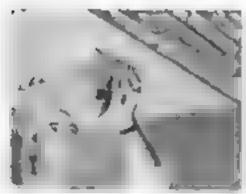
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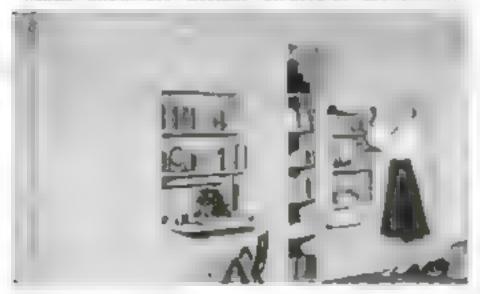
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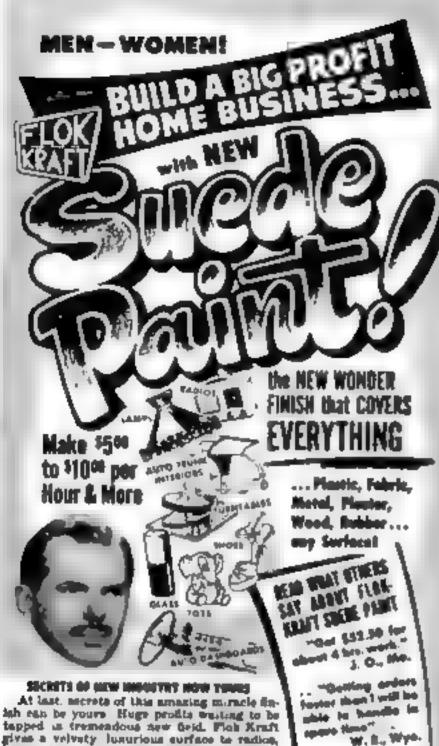
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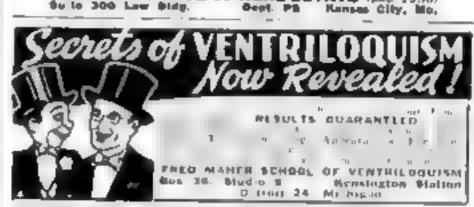
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I am Sa sa Manager for a very big manufacturing company. We make State east Stee, fooking Utensile. We do so entermus business with he els. resta rante his, tass and institutions. We also make utensile for the Army Savy and Air Force.

As a result, we have very low manufacturing costs. We can well a set of Standess Steel (sokware for home use for about wout it rests some companies to make it! In fact, for years we do; sed to one Sang Organs to be who result our conswere home to home under the rown name. They get \$120.00 for the same set that our people sell for approx matery half of that,

You've probably heard of someone who give dinner parties in himse and then take orders from the ladge win attend. These sates neg bare to get a high or ce between it costs money to give parties—he has to make his shire—and bis supervisor has to make his. The sales organization adds a profit and the manufacturer has to make his. So there are about four or five profits added to the petual manufacturing cost.

About two years ago I got to figuring. There are five good remains why Stantiess Steel is the hind of cookware that alcoud he in every home. 1. It washes an easy as a drinking glass. No security scraping or scrabbing 2 it doesn't fust or corrude—and a doesn't stain. 3 it doesn't affect the taste of food 4 carlton Ware enables you to premie food by the method called 'waterless cooking which keeps more of the patter I in negate and y taming in your food and makes the food taste better. 6 Boy it once and you're all through buying for life. You can't wear it out.

You see, Stanless Steel is not a coated or plated metal, like chromium pluts on the bumper of your car. That chromium plate can chip or wear off and exputes the new steel underneath. Then the steel rusts. But our kind of Stainless Steel is stainless all the way through. It can't chip, crack, peel, or wear off. You craid use a set the rest of your lifetime and then give it to your children and it would still be good for their children.

Well, I figured that if the price was low enough every family could afford Stainless Steel Carlton Ware. So I worked out this plact. We would sell a complete set of 15 pieces at a figure that would include our profit. Then you add your profit and re-sell the set to your friends and neighbors for just about he for the usual price charged on the "party plan." They are glad to get such a bargain and they feel that you've done them a rest favor.

The plan becomes like an endless chain. When a woman gets her first piece of Carlton Ware she gets so thrilled with its better cooking and easy cleaning that she talks and talks. She can't wait to demonstrate it to her friends and tell them all about it. She's so proud of its savery sheen that she just "bubbles over." So just by jetting your own friends in on a good thing, before you know it their friends call you up and ask

if you can get the same low prices for them. Then their friends call you and their friends' friends. It goes on and only

Now, I'll let you is an another part of my plan. If you take only ten set orders a month for any none he my company pays your expenses for a winter vacation a Florida. We make in a beautiful resort in the foundation at company expense.

Get all the information right now fill not only be glad to send free letter at in. I it also head you a complete demonstrating outfit that a mean show to your frounds and neighbors. And I is a converse to attractions by which you can write up office without ever trying to sell and without making any bouse-to-bouse casts.

Everything I send you is free, When you qualify, I it even furnish you with a complete In-piece set of Luctua Ware to use in your own kitchen and show to your friends. It say nates bonus I give to encourage good earnings on your part.

Send your name today in confidence. You'll be gird you wrote. This ad may not appear is this magazine again, so don't take any chapter on losing out. Bend the coupon of just send your name on a postrard. I want send any entermen to call on you and you won't be under the slightest obt gation.

F. T. Strong

Carlton of Carrollton Carrollton, Okio

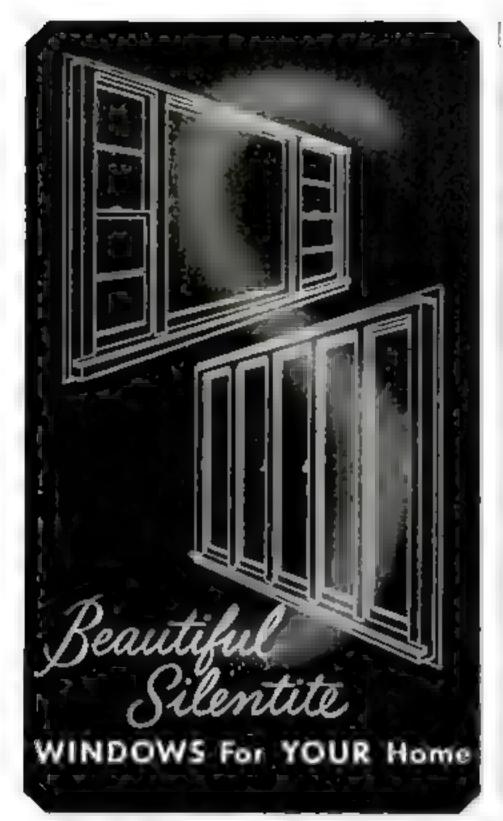
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Dear Mr. Strong: Please send me free and without any obligation a complete artifug and demonstrating outsit with exact instructions for making an extra \$125 a, month. I don't want to do any house-to-house selling, but I will show your products to my friends and give them the advantage of the low prices.

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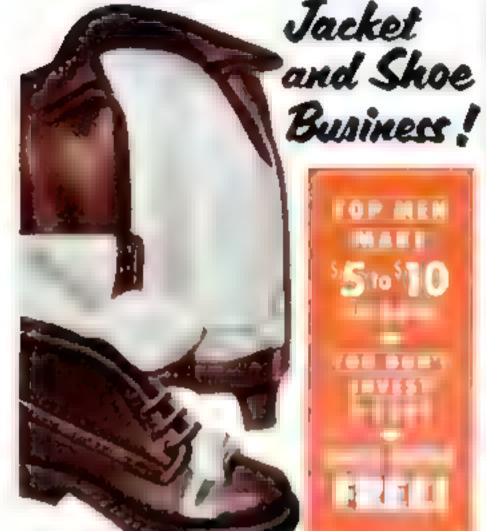
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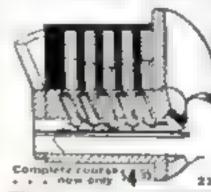
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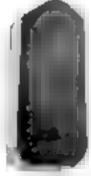
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Start on a SHOESTRING!

The conf-life sincise of success in Mail Order can take fory toles. If I had not personn a broken these pauple their of steel would be hard to tolteen. Yet they are not only frue, but they represent that a free of the hatsteels of the personal who have been awapt and his manay by Mail Order.

DANCS. I personally guided his story when he invested on automore guide presser. He storted whit may felle up to mee magazine, four years later he tolled — with amough real exists to heap him his in qual-income the rest of his late.

VAN MADE. I regress with him for all, years. I not him when he was a region man for a top and coffee house, snocking an doors. He want into him the start on mothing small manage from the start method up till years form with savings of \$30,000 and an incorne of \$3000.00 a year for the without further work.

OUGOAN. A few years upo he was a truth driver Started faciling with Mad-Order in a space room in his space him, Lost your he said, "I don't know how much fin marth-rafter you got the first willow you gult knowing trank."

MRS. PRECOL Started a smoot Major Corder business of honor-just to being secupled. It tooking good and she came to see for selection. Showed her how to happend be two years the business per so higher her herbond resigned his job to help money as it.

FORMAN Forman weeked as a heck uniter at \$70 a week. He had rate tong to the examinate time and add affecting something to distribute and additional tongs to had to find a source of supply He made 5 8,000 the first year. He gives me credit for "showing the May."

JOSEPHION. Consulted me about a specialty product. On my advice he raw one ad to "lest" its selectivity. That adbitrought sales of \$50,000, is his line year he did a business of nearly a half addition deligns, this original investment was less than a thousand.

These things I have now. Them prople I have helped to the residuation of their dream these and hundreds of others. My own for turn was made in Mail Order. And how my secrets can be yours.

Have you ever thought of running a profitable little adeline right from your home? Has it occurred to you that you are just as capable as anyone else of making money on a product or service that can be sold by mail? Have you ever looked into the Mail Order business as it's run (on they investments) by innumerable small operators?

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dumping them in the Post Office.... and quietly banking the fistful of Money Orders, cash and checks delivered to them daily by the mailman.

An annual business of almost a billion dollars is done by "lattle fellows" who advertise and sell just one item! The Department of Commerce of the United States says, "A number of the most successful obtain incomes as high as \$40,000 to \$50,000.00."

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Glance at the examples at left. These true stories are far from unusual Multiply them by the hundreds and you begin to get an idea of what can be done..., what is being done...in the phenomenal Mail Order field.

Yet, if you were to jump blindly into Mail Order your chances would be slim. A peculiar brand of "know-how" is vital in thus little - known, little - understood business. This is fortunate for you. If any Tom, Dick, or Harry would "click" in Mail Order, the field would have been overloaded years ago.

But now you have the opportunity to learn the authentic secrets of successful Mail Order operation. They are revealed for the first time, step by step, in an extraordinary new Survey . . . the L.W. Confidential Mail Order Letters.

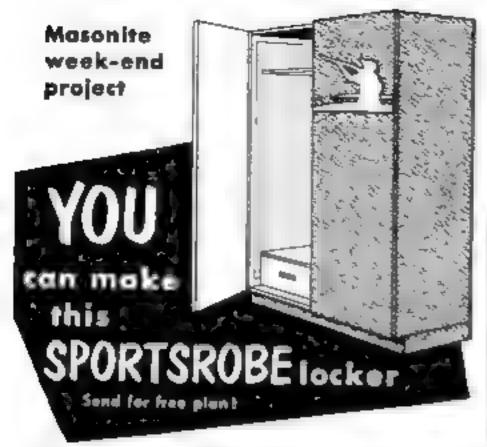
This Survey is not a course—not a book—not a group of lessons. It is a sample guide that anyone can follow. It shows you how to pick the right product for Mail Order, It shows you exactly how to start a profitable business fast, with cash or Money Orders in the envelopes you receive. It shows how to buy your product out of the very money you get in the mail, so you don't have to tie up cash in large supplies of your product. It gives you actual examples of admind letters, analyzed to show how and taky they make money It demonstrates the months to start, the time to expand, the best way to get prospects' names. It reveals from A to Z the confidential facts that have made fortunes for Mail Order operators who use them,

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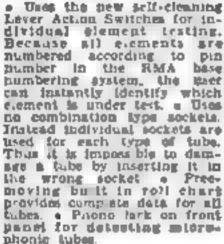
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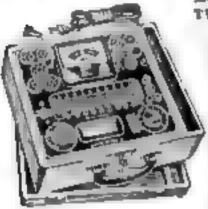




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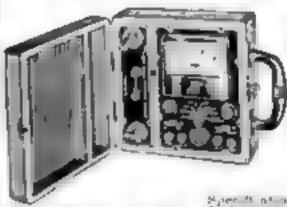
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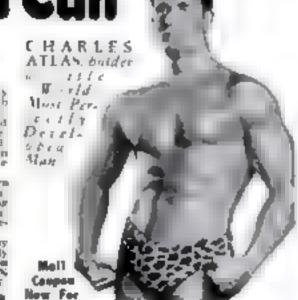
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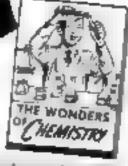
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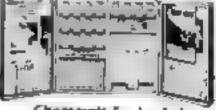


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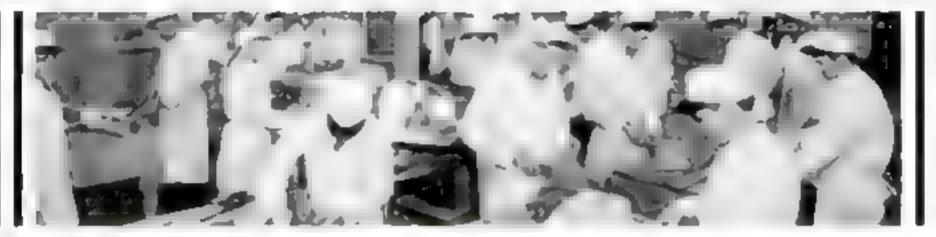
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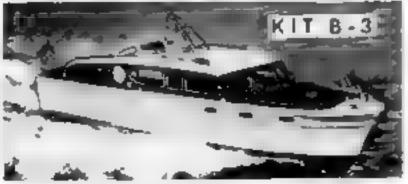
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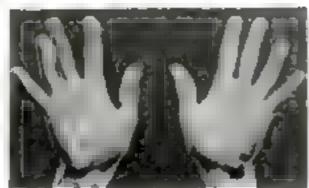
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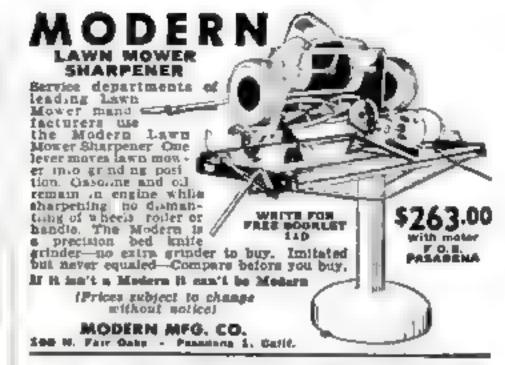
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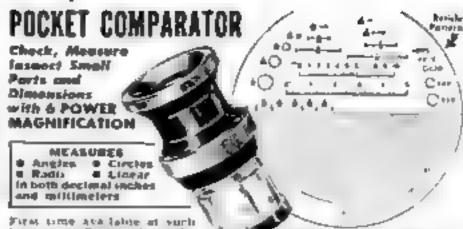
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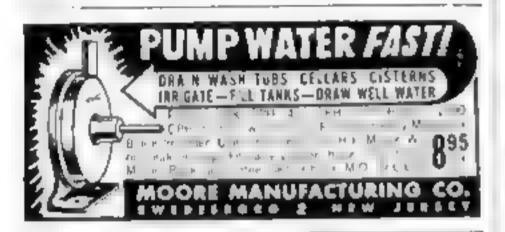
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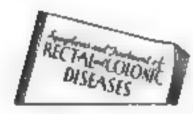
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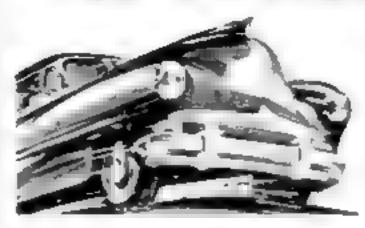
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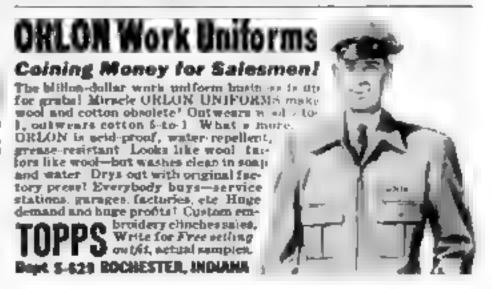
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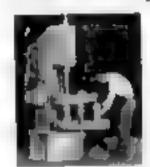
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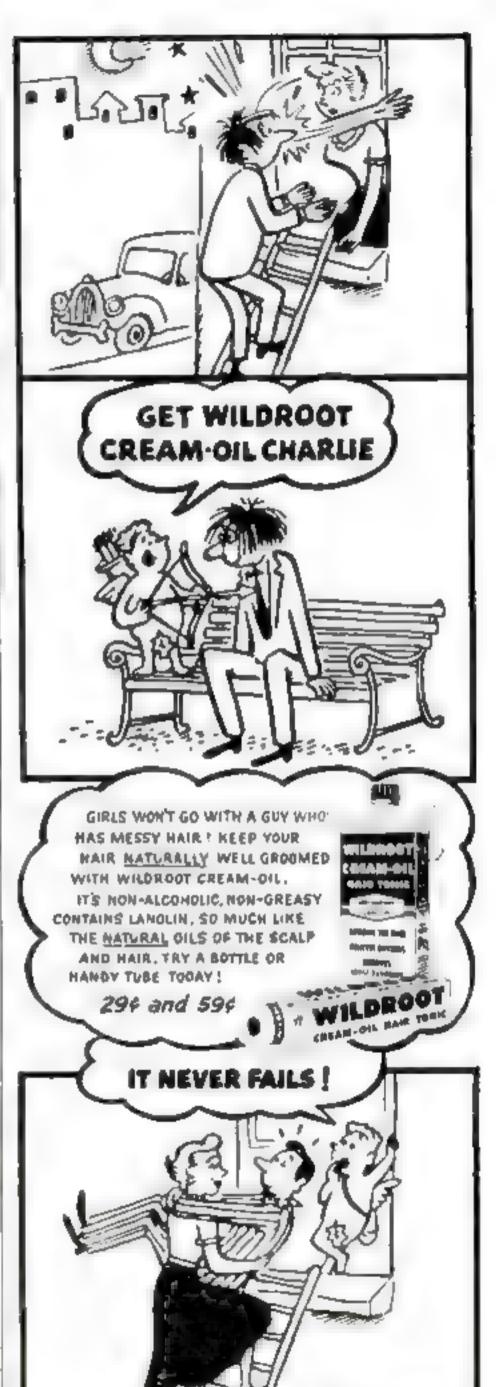
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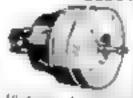


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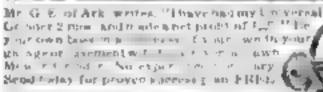
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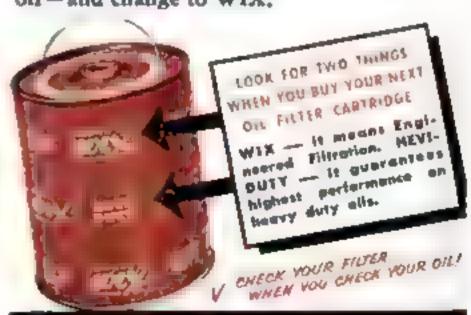
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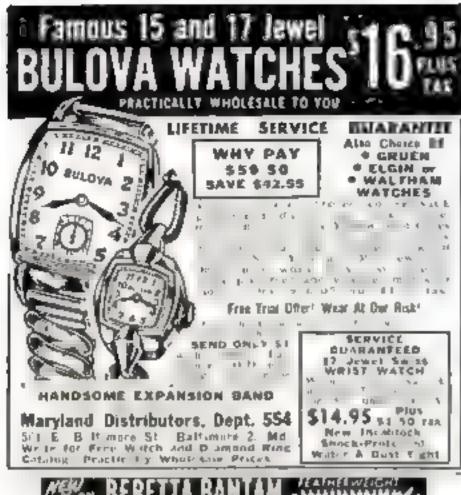
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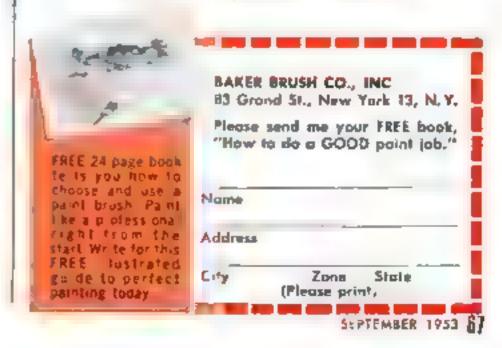
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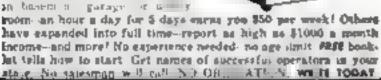
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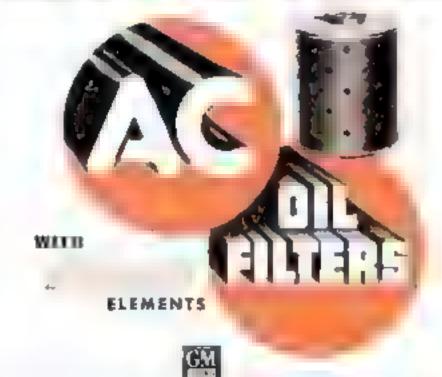


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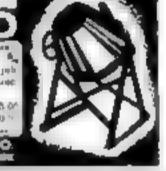
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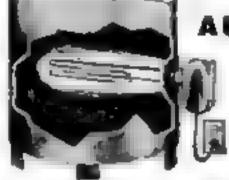
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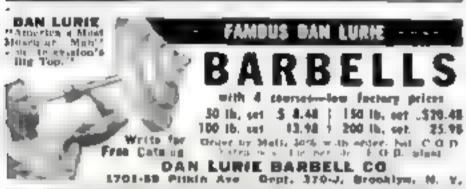


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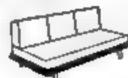




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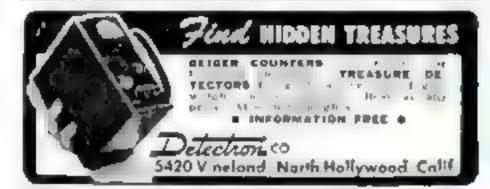
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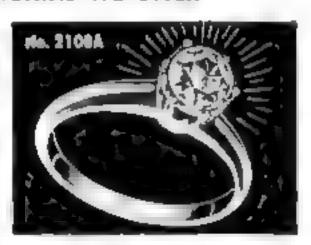
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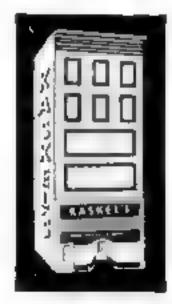
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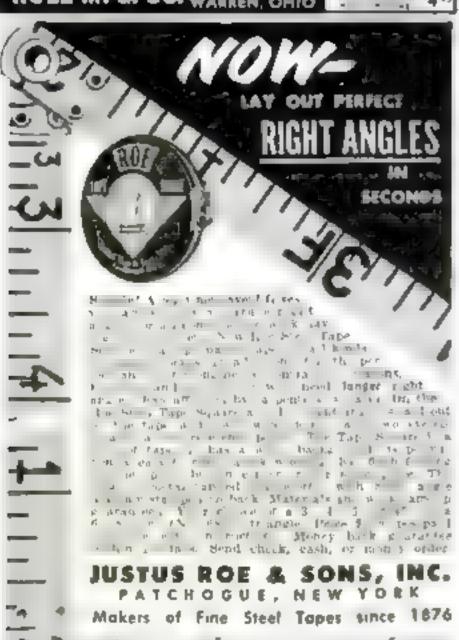
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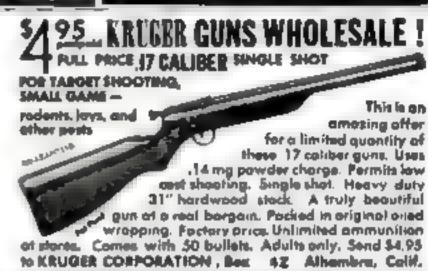


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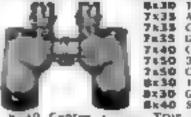


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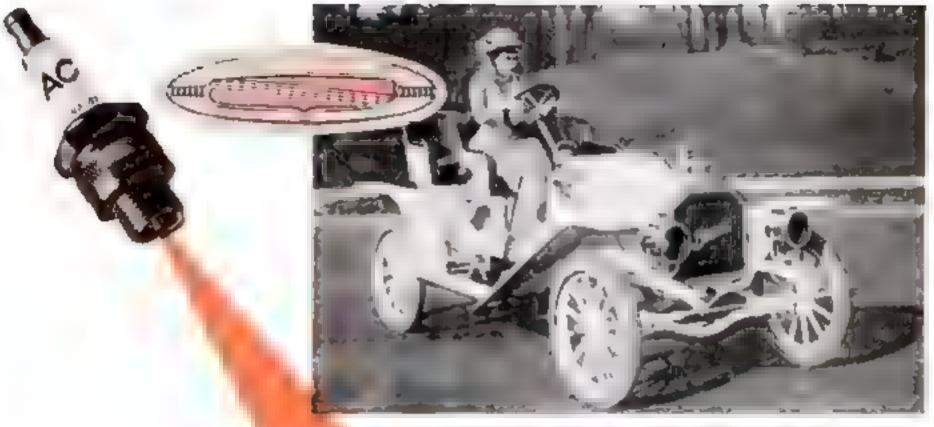
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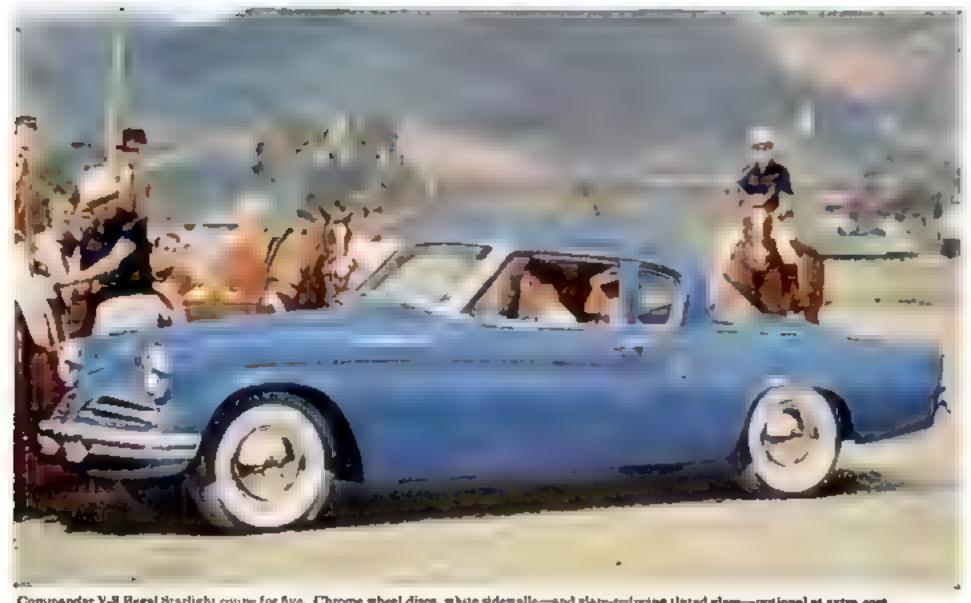
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Denver Pedestrians Jaywalk Because

Their 'Barnes Dance' Cuts Traffic Toll

When cars stop, folks in the mile-high city head in every direction to cross streets as noted traffic engineer taught them.

By Wesley S. Griswold

SHORTLY after dawn, the driver of a Denver airport bus braked to a stop at a red light hung over the middle of a shady block and grunted. There was no intersecting street there.

"We are now waiting for the ants to cross," he said sarcastically to his passengers. "This is some more of Henry's work."

"Henry," sometimes called "Hustling

Hank," is a man named Barnes. Every driver in Denver knows about him. They have jawed and jeered at him, admired and praised him, while he went about rescuing them from the awful mess they were in six years ago. "Creeping chaos," he called it.

Now that the fuss has died down, Denver, with nearly twice as many cars as it had when Henry Barnes arrived to be its traffic engineer in 1947, is twice as safe a place to run around in as it



NEVER OUT OF TOUCH with Denver's traffic problems for an instant, Barnes had police radio, phone and dictaphone in his official car. He dictated memor as he went his rounds.

"SCOUT BARNES AT YOUR SERVICE, MADAM" was the title of this cartoon by Paul Conrad which the Denver Post ran when it announced that Barnes was leaving for Bultimore.

He prevented passenger cars from park-

was then. The death rate in auto accidents has been cut by more than half. Thirty minutes have been shaved off the nightly rush hour. Pedestrians, who used to lose around seven of their number every year crossing the downtown streets, have learned to do a "Barnes dance" that has kept them all alive,

Barnes has taught Denver folks to believe in signs-thousands of them, He created one-way streets by the dozen, lengthened "through" streets by scores of miles, and planted a forest of parking meters. He erected hundreds of new signal lights, got the police to crack down savagely on double-parkers, and limited parking to one side of one-way streets.

ing anywhere in the shopping district for two and a half hours early each workday morning while trucks loaded and unloaded. The trucks stayed out of the way the rest of the day. He showed pedestrians an exciting

new way to cross a street and invented an electronic brain to direct traffic with maximum efficiency at 120 of the city's busiest intersections.

While this was going on, Barnes, who 15 years ago didn't know what a traffic engineer was, was becoming the bestknown-and best-paid-traffic engineer in the U.S. Baltimore has hired him away from Denver at \$18,000 a year to per-

NO JAYWALKER, the young man below started out on a "Walk" signal. It now reads "Don't Walk," but that's to halt the people at the curb. He still has time to get across.

"JUST LIKE CHINESE SCRIPT" were Denver's old vertical street signs. Many drivers had collisions trying to read them. Barnes uprooted them all, put in 20,000 taller, horizontal ones.



form his surgery on its clogged arteries.

Denver, a little less than half as big as Baltimore, was spending only \$6,800 a year on its grievous traffic ailments when Barnes was called from Flint, Mich., to take over. In the nearly six years since then, Barnes' prescriptions have cost Denver more than \$3,000,000 and many a twinge. But, urged on by the mayor and city council, and coaxed by the newspapers, the patient has taken the medicine with only a reasonable amount of grousing.

"Being a sort of an ignorant fellow," says Barnes, who educated himself with 20 years of night-school classes and correspondence courses, "I often did things nobody had tried before. That always arouses suspicion. But the things made sense to me, and they usually worked

out all right."

Instead of putting the law on Denver's jaywalkers, for instance, Barnes encouraged everybody to imitate them. At the neon signal "Walk," pedestrians at 53 downtown intersections can cross the streets any way they like. Many of them chose to head across the intersection diagonally. Meanwhile, though, all automobile traffic is halted.

"If you don't avoid mixing cars and people on foot," Barnes says, "you're bound to get succotash."

When the crisscrossing streams of people on foot have completed their "Barnes

"HENRY'S TANK TRAPS," as people jokingly called them, indicated where future isles of concrete would channel traffic and provide pedestrian refuges at this broad junction of

dance," first one line of waiting cars and then the other is given a green light. Pedestrians, now stopped by "Don't Walk" signs at every corner of the intersection, are kept entirely out of the way.

This arrangement not only put an abrupt end to pedestrian deaths at down-town intersections, it also enabled as many as 15 cars to turn a corner in the time it had taken one to do so before.

It took a little while to get the hang of the "Barnes dance," but 80 percent of the people of Denver now think it's fine,

according to the local Post.

The idea for "Barnes' second brain," as his electronic traffic-control system is often called, was first put on paper in a New York hotel dining room one evening about four years ago. Barnes sketched it out on scratch pads and the tablecloth for a couple of electronics engineers. It then took two years to design, build and install the "brain," at a cost of \$115,000.

Lights Are Adjusted by Remote Control

Described as simply as possible, it is a means of constantly sampling the traffic that is entering, leaving or milling around in downtown Denver and, by remote control, automatically adjusting the signal lights at 120 intersections to move the traffic steadily whether it is heavy or light.

Rubber treadles-technically called

Denver streets. It had neither signal lights nor safety zones when Barnes went to work to make it safe. His "traps" were constructed of yellow five-gallon cans, filled with sand.





TRAFFIC FIELERS — pressure-sensitive vehicle detectors set in Denver pavements—send electrical impulses to a central electronic brain in the city hall. The brain notes traffic vol-

ume and automatically slows down or speeds up rows of dial units (right) that regulate the signal lights at 120 downtown intersections. Henry Barnes originated this system.

"pressure-sensitive vehicle detectors"—set in the pavement at six crucial places, sample the traffic flow as cars pass over them. The treadles flash impulses to a quiet basement room in Denver's handsome city hall. Here there is a train of metal cabinets, looking very much like an electronic computer. Impulses from the treadles enter one of these cabinets and accumulate there briefly. Every six minutes, they are "counted" automatically.

If more of them arrived in the last six minutes than in the previous six, traffic in certain parts of town is obviously picking up.

Electronic selectors note this fact and instantly arrange to keep the green lights on for longer intervals along the routes that the increased traffic is traveling.

Less Traffic-Faster Lights

If fewer treadle impulses arrived in the last six minutes than in the six minutes previous, the selectors speed up the rate of change of the signal lights, so that the fewer cars moving on those routes won't be held up unreasonably long at the intersections.

A master selector analyzes what is going on at all sampling points-for traffic naturally isn't simultaneously heavier or lighter everywhere—and arranges the behavior of the signal lights to accommodate more cars here, fewer there.

Henry Barnes, at 46, is a graying man, still somewhat gaunt from a critical illness last spring. At the time of his departure from Denver, however, he still deserved the nickname "Hustling Hank." The energy and enthusiasm that had kept hun probing at Denver's traffic problems 60 hours a week for five and a half years, ignoring vacations for the first four, hadn't diminished a bit.

Up till the end of his stay in the Colorado capital, he still restlessly drove about its streets whenever he could do so, hunting for bottlenecks in the making. His special car was equipped with dictaphone, telephone and police radio, and his 80-man staff frequently was made aware of the fact that he was on the job even when he was out of their sight.

One ear still gives him trouble as a result of its being frozen one winter morning when he discovered a stuck signal light on the way to the office. Barnes spotted the faulty light, noted the cars it was starting to block up, sent out a radio call for a repairman, then got out

[Continued on page 258]



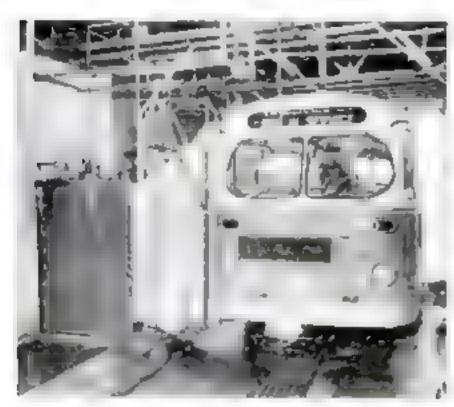
Bantam "Bat" Gun Can Knock Out Heavyweight Tanks

A MODERN version of David's slingshot, this new "Bat" gun is claimed by the British to be able to "slay" the biggest of war's Gohaths—tanks—that it is ever likely to meet in battle.

The recently demonstrated tank-killer is a 120-mm, weapon. It weighs only one ton as compared with the three tons of the 80-mm, gun British infantry battalions have

been using against tanks. The But's killer punch her not only in its large caliber but also in the power of its shell, the secret of which has not been revealed.

The new anti-tank weapon is non-recoiling because its movement when fired is balanced by a backward escape of gases through a vent. The gun can be towed by a jeep or carried in a light tank.



Giant Cleaner Sucks Out Bus

A Cutcaco company cleans out 110 buses every 24 hours with a king-size vacuum cleaner that attaches to the front door and inhales all the debris in each vehicle. Two 28 inch vacuum fans create air pressure behind a huge bellows that does the job. A man helps remove stubborn particles with an air hose.



Japanese Drive Dummy Tanks

FLEDGLING tank drivers in Japan's security police force learn the ropes in the weird contraption above. Instruments, brake levers and periscope are copies of those in a U.S. Army M-24 tank.



Biggest Statue Re-creates Stirring Scene of World War II

Largest of its kind, a 110-foot-high memorial statue is nearing completion for Washington, D. C. The 100-ton bronze work of art will depict the historic raising of the Stars and Stripes atop Iwo Jima, by five Marines and a sailor, during the fierce battle that wrested the strategic volcanic isle from Japan in 1945.

Pictured above is part of the full-size plaster original with its sculptor, Felix de Weldon. The gigantic figures are faithful liknesses of the heroic flag-raisers—Sgt. Michael Strank, Corp. Harlon H. Block, Pfcs. Franklin R. Sousley, Rene A. Gagnon, and Ira H. Hayes, and Navy Pharmacist's Mate 2nd Class John H. Bradley.



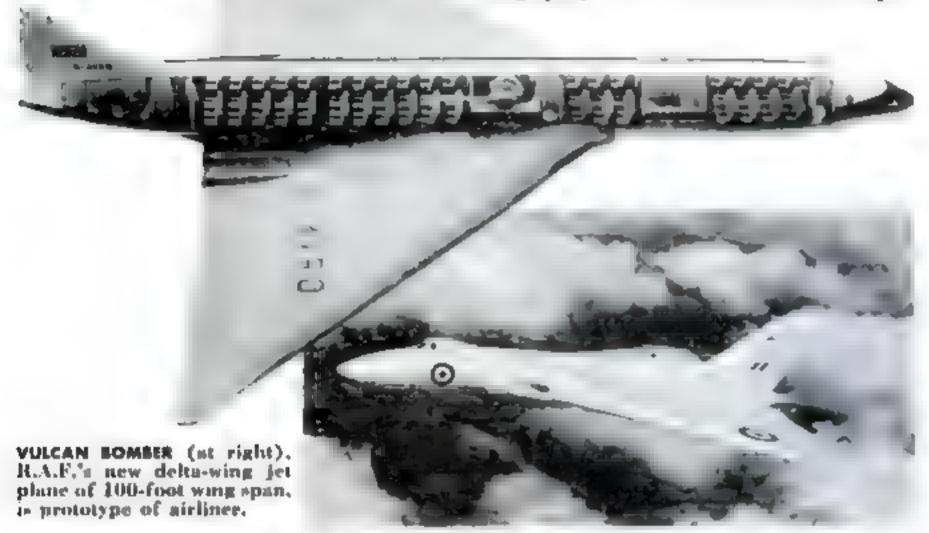
Rapid Reading is Taught by "Pacer"

In schools, homes and offices, the Shadowscope (left) trains a user to read more rapidly. A strip of illumination, covering a few lines of text, descends a printed page at adjustable speed. Setting this just a little faster than his usual reading rate, and using the device as a reading lamp, an individual learns to step up his pace. The trainer is made by Lafayette Instrument Co., Lafayette, Ind.

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perta-wing airtimer shown by model could cross Atlantic in five and a half hours eastward, seven hours westward. It has 121-foot wing span, cruises at more than 600 m.p.h.



Triangle-Winged Jet Airliner Designed for Ocean Flights

Called the Avro Atlantic, the huge jet author pictured above could fly from New York to London in five and a half hours. The projected craft is sponsored by a leading British plane maker, A. V. Roe & Co., Ltd., and informed sources predict that it will be built. A larger counterpart of the Vulcan jet bomber, designed by the same firm, it likewise has wings of "delta" or triangle shape, which have favorable characteristics when the speed of aircraft ap-

proaches that of sound. Interior design may be varied to accommodate 80 to 130 passengers.

The craft would fly at 40,000 to 45,000 feet, climbing steachly as fuel consumption reduced weight. Then, cutting off power 200 miles from its destination, it would descend in a high-speed glide. Because of a jet plane's mechanical simplicity and the short time required for the ocean hop, a flight crew of only three would suffice.



French Glider Tests Delta-Wing Design

DELTA-WING aircraft, already introduced in Britain (see top of page) and the U.S., are now under development in France.

First French design to fly, the one-man glider at left has a 47-foot wing span. In trials, a four-engine Languedoc has towed the 2,800-pound craft at an altitude of 25,000 feet and unofficially reported speeds as high as 400 to 500 m.p.h.

Talkative Terrier Speaks 20 Words

HOLLYWOOD'S latest find is the who can out talk eighteen-month-old habies. Named Mr. Lucky, the seven-vear-old Boston terner not only forms 20 distract words, but rolls them out in clear cut sentences. I want my ball? "Let's go for a ride," and "No. I won't." are standard conversation phrases for Mr. Lucky, who made his first speech-"Aw, come on home now"-at the age of 10 months. His owner Mrs. John T. Davis brought hun to the coast from Midvale, Utah, to do a documentary film which will be released this October, Big question in everybody's mind but Mr. Lucky's has he the start of a motor speech center m his brain? If so, his sons may speak with a Boston accent



MR. LUCKY'S OWNER could hardly believe her ears when her 10-month-old Boston terrier barked. "As, come on home now."

Walking Bed Alds Polio Victims

LEVERS on this idjustable steel frame move foot, leg and back supports which simulate walking action. An Allegan, Mich, electrician, Ralph Gross, designed the machine after his wife was stricken with polic. It puts practically all body muscles to work, and exercise may be increased by elevating frame.



No need for chipped ice when you serve chilled drinks and salads with a new type of service ware which has a refrigerant sealed between its double walls. Tempin-ware is pre-chilled in refrigerator. It is sold by Redi Products. Passana, Calit.

Crib Clips to Baggage Rack

Byes gets in upper berth all to himself in this new rig under test by British Overseas Airways Made of metal and plastic dot! the cub has a side flap that clips up to hold baby safely in





FIRST TO CROSS FINISH LINE in the world's longest sucht race this summer—from Los Angeles to Honolulu - was the 161-foot schooner Goodwill, above. She made the 2,225-nautical-mile cup in 11 days, 2 hours, 17 minutes, 24 seconds. Owned by Ralph L. Larrabee of race pictures appear on next two pages,

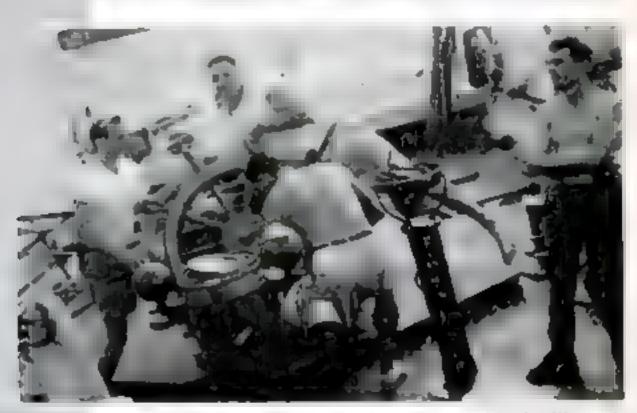
Huntington Park, Calif., she cost \$750,000, was manned by a crew of 45 unpaid ampteurs. Thirty-two yachts in "Cocoanut Derby," from 36-footers up to the Goodwill, were valued at a total of \$6,000,000. Other

Amateur sailors in \$750,000 schooner finish first in

World's Longest Yacht



THEY'RE OFF: Smaller competitors are seen from deck of Goodwill as 32 yachts, closely hunched, crossed 1,000-yard starting line.



AT SEA: Three crewmen keep Goodwill's rudder steady in Pacific squall. Her top speed for the race was 15 knots in a 35-knot wind.

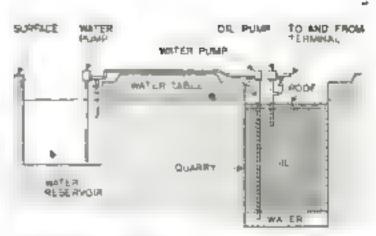


Race

FINISH: Actual winner, because of hundren for her small size, was 39-foot Staghound, seen finishing in darkness a day behind Goodwill.







WATER FROM RESERVOIR, (at left on drawing) would be pumped in and out of oil pit to keep desired level. Light oil floats on water.

Abandoned Quarries May Make Cheap Oil Tanks

FUEL oil may soon be stored in abandoned slate quarries, such as the water-filled one above. One company hopes to save money by pumping oil from the Atlantic coast to empty pits near Bethlehem, Pa., pumping it back as needed. To keep it from seeping away, the oil must be kept below the local water-table level. To do this, re-

gardless of the amount of oil stored, water kept in other pits nearby would be pumped in and out, Floating-pontoon or suspension roofs would keep out dirt, light and birds. Engineers are picking the deepest, narrowest pits, figure they would hold a winter's oil supply for 325,000 homes at a cost one-sixth to one-half that of steel-tank storage,

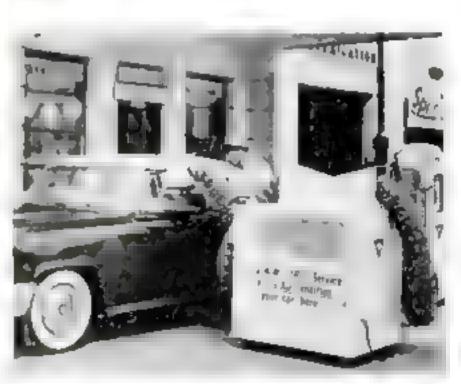


British Sharpen Radar's Eye

WITH a new radar unit that is able to tell instantly whether an object ahead is a rock or a ship, Royal Navy vessels now can move through dense fog or deep night as surely as cats.

The improved radar superimposes on its scope the reflected image of a navigation chart of the same scale. The user looks at the combined picture through an eyepiece (above). Meanwhile the unit shines an arrow on the chart below it to show the ship's position and heading.

►► A new closet drier consists of a small metal tube, open at both ends and surrounded by an electric heating coil. Air circulating through the tube is heated to decrease the humidity and prevent miklew. The tube is plugged into any outlet and hung up in the closet. It is made by Airdri Associates, St. Petersburg, Fla.

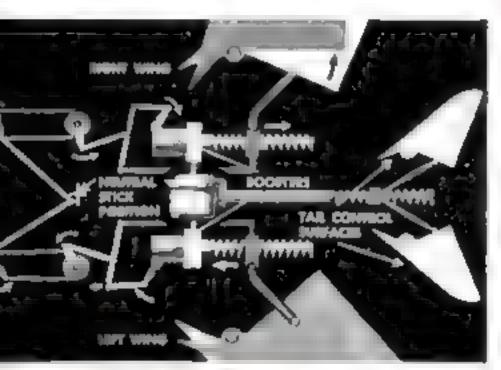


"Fill 'er Up with Cold Air!"

Texas gas stations are delighting motorists with a new kind of free air. When a car stops for gas, a nozzle fixed to an air conditioner is poked in the window. Station attendants say temperature inside the car drops as much as 20 degrees in two minutes.

** Ilot Moves Wings to Control Plane

The next thing to flying like the birds is to climb, dive and turn without benefit of ailerons, elevator or rudder.



schematic orawing of wiggle-wing plane shows how movements of wings and tail surfaces are coordinated. Buosters amplify pilot's muscle. Pinion gear in center serves only to move tail surfaces back and forth.

A BRITISH airplane designer is copying the birds to devise a new way to control airplanes in flight. He is experimenting with moving the wings of planes—particularly those flying at supersonic speed

Instead of moving the wings up and down, he moves them back and forth. The wings on each side of the fuselage can be moved differentially—one forward, one backward—to make turns. Even the stabilizing tailplane moves.

If the design proves successful, it will represent the biggest change in the basic principles of flight control since the first man-carrying powered flight 50 years ago. The British designer has made

Single Control Governs Plane

Prior cleabs, dives and banks plane around its three axes of rotation by moving control stick alore. Conventional planes require coordination of stick and rudder. Big difference between this plane and Bell X 5 is differential sweeping of wings.





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model tests, with radio control, of the new plane.

The experimental plane eliminates the conventional control surfaces. It gets all its control from wing sweep. For take-off and low-speed flight, the wings are in the forward position (see sketches). For high speed, the wings are swept back

Swept wings do not have as much lift as straight ones, but planes so equipped can fly faster—they have less drag, less friction with the air.

For turning, one wing is swept back the other forward. The difference in lift cocks the plane up on one side and air pressure turns it.

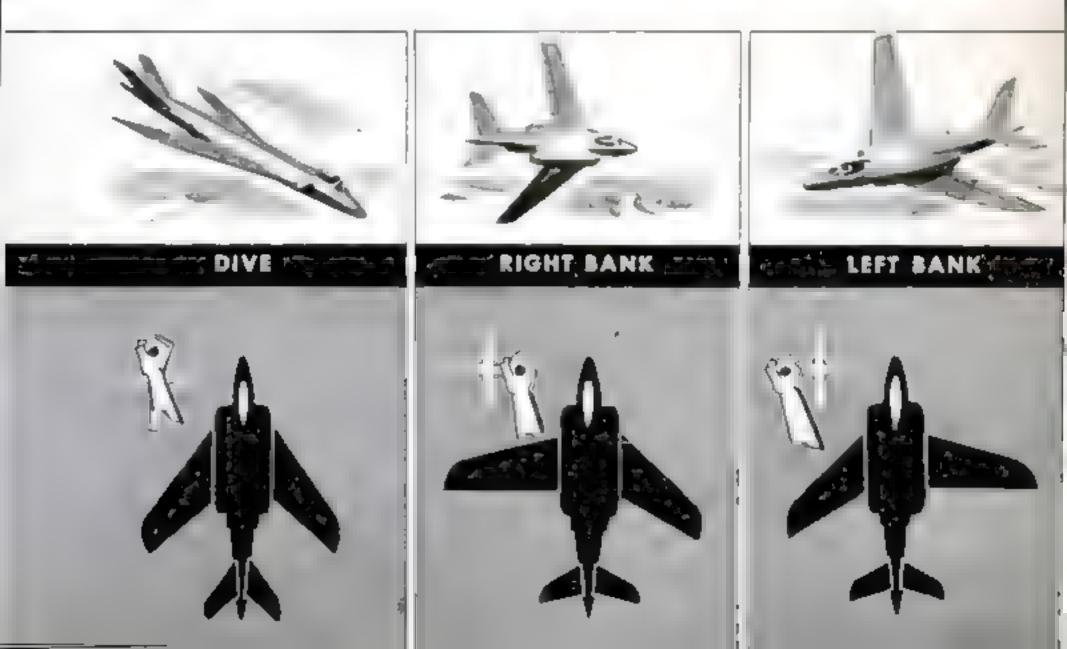
From level flight position, the plane dives by sweeping the wings farther back. It climbs by bringing them forward, increasing lift. The tailplane moves back and forth with the wings in order to maintain the plane's fore-and-aft balance.

In landing, both wings are swept forward. High-lift flaps, used as auxiliary lifting surfaces, are extended the full length of both wings since control aderons are eliminated.

This isn't the first plane to sweep its wings back in flight (PSM, Aug. '51, p. 84), but it's the first to propose control by sweepback.



WING MOVEMENTS are expected to afford a degree of control impossible to achieve with allerons, elevator and rudder. Flaps to boost lift for landing and take-off will be more effective on a straight than swept wing.





News from the Navy

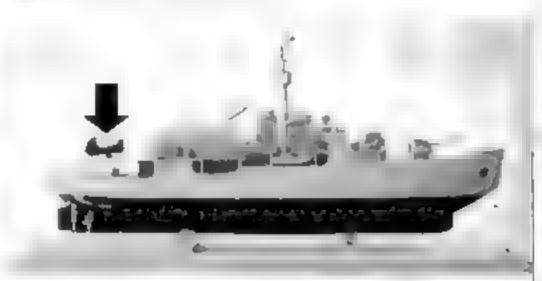
Radio Paddles Speed Landing

A two-way radio with lip mike, controlled by push buttons on his signal paddles, lets this carrier landing officer talk directly to pilots when message is too complex for paddle signals alone.



Wings Give Boat a Lift

The surface Navy has its own "wings" now. At high speeds this test craft lifts from the water and skims on planes called hydrofoils. Speed is greater, less power is needed, and the ride is smoother.



Helicopters Scout Ice Fields

Our Navy's newest, largest, most powerful (21,000 hp.) icebreaker, shown above as a model, will not smash blindly through ice fields. The 8.300-ton ship's two helicopters (arrow) will scout floes ahead.

Atomic-Age Headquarters Ship Is No Sitting Duck

The new USS Northampton, a lightcruiser-type command ship carrying fiveinch guns, reveals lessons of the Bikini test. Operations commanders and communications centers require more speed and protection than given by converted liners in World War H. Ship's streamlined superstructure, air conditioning, and extra-strong hull are tailored to atom war. Even radar autennas are armored.





Radar-Reflector Target Buoys Double for Enemy Submarines

AND THE 25 rules offshore, these radarreflect—target leave as lengther study of exclusional attack problems. They hounce back is lar venilla to the scopes of attack ingopeness or lating the blops of actual subs. The reflectes made of quarter inclusions.

steel, form three planes, each five feet eight mehes square, standing at right angles to each other and intersecting along their majorials. The 10-foot-high plays a standard moon gatype arount battery-powered lanker lights and are chain-anchored.

You Can Break Away Faster with

Detroit's Newest



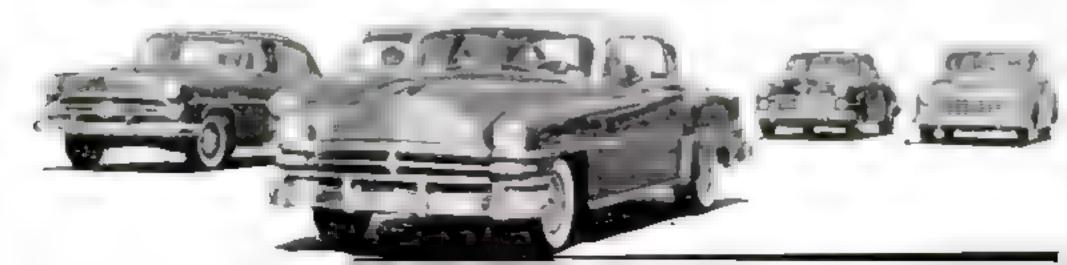
The PowerFlite is Chrysler's nomination in the Green Light Stakes. It looks good on the chart.

CHRYSLER has a new, fully automatic transmission, (Cries of "At last!" from friendly critics of the company will be temporarily ignored.) It is, in truth, a sweet basket of gears, with features that include:

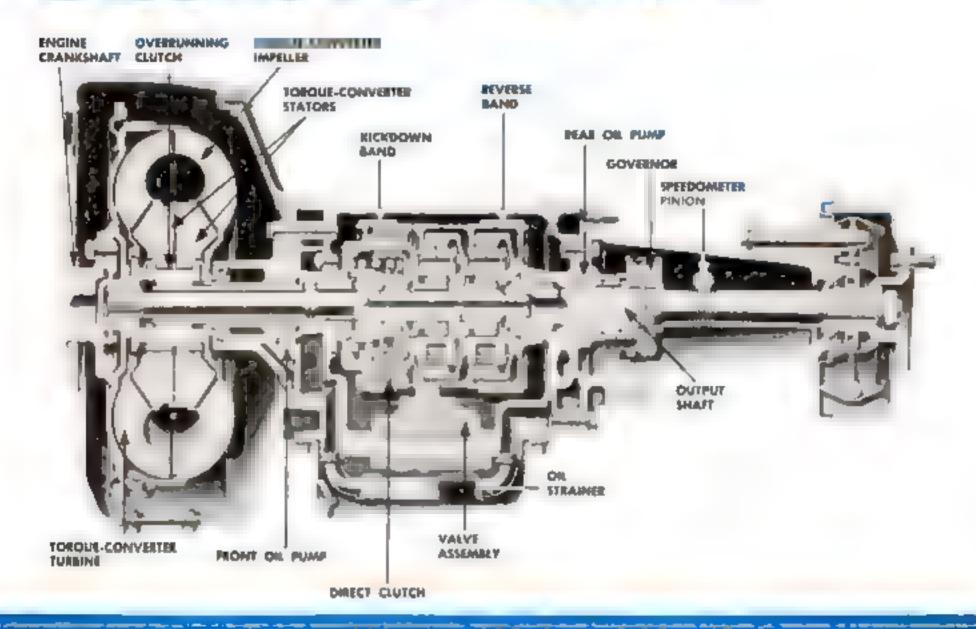
 Sassy getaway, right in the running with the best U.S. entries in the Green Light Stakes; No clutch pedal, and upshift without accelerator ease-up-both for the first time in Chrysler-built cars-and

 Notably fewer parts and pounds than any other automatic now on the market.

Currently available on Crown and Custom Imperial models, the new drive has been christened the "PowerFlite" transmission by the salespeople. Around the



Basket of Gears



shop Chrysler engineers call it the "A323 job" and regard it with real pride. This reporter, having poked cautiously into its innards and having put some miles on it, is almost tempted to give up his long-time love affair with manual-plus-over-drive. If you like automatics, you'll find that PowerFlite is one of the best; if you dislike them, it may even change your mind.

What's inside? A323 uses a torque converter feeding into an automatic planetary gearbox, which is roughly the same as every other U.S. automatic except Hydra-Matic. What makes it good is that Chrysler has put a big chunk of engineering time and money into boosting torque-converter performance, and into smoothing out the valve, clutch, and servo actions into silken inconspicuousness. You

start out without wallowing in wasted revs, once rolling you have to stay alert to detect the up- or downshift.

A323's converter has the highest starting torque ratio in the industry. This ratio, 2.6 to 1, means that at the moment of start the converter is doing more to help the engine get the car rolling than any other U. S. converter. Since Chrysler's big V-8 pours out a potent 312 footpounds of torque at comparatively low speed, she gets off hke a gone goose.

There's Little Slip When It's Coupled

Up toward the other end of the range, when the converter is all through converting, the unit has remarkably little slip. Slip—the revs an engine delivers that never get through to the drive shaft—are reported to be a piddling 19 to 2 percent

when she's "coupled"—when the converter stators start to free-wheel and the gadget changes itself into a fluid coupling.

To fathom the meeties of torque-converter design you need to be a slide-rule guy with knobs on. It's possible, however, to follow Chrysler along certain of the paths by which this converter was achieved. There are at least four main elements that a development engineer must juggle:

 Diameter. The smaller a converter is the less it costs and the less humpy the floor in front; the larger it is, the better are its performance characteristics.

2. Torque multiplication. This is what

you are mainly after, so the more the better, if you don't have to pay in a falling-off somewhere else.

3. Stall speed. This reflects how high the engine winds up on starting, and wants to be kept as low as possible. (Weakness in this department was the big complaint directed at early Dynaflows.)

4. Efficiency. The less gasoline-fired heat thrown away in an oil radiator or in air-cooling vents, and the less engine energy spent in slip, the less a torque converter will cost to run.

Each of these elements is tied to the others. A de-

signer can gain a lot on torque or efficiency, say, if he'll take a beking on stall speed or use a whopping big converter. To find a balance where all factors are nicely adjusted is a critical part of turning out a good design. Especially when the designer must also sweat over getting some engine braking, tailoring the converter to suit the engine's curves, and specifying turbine and impeller blading that can be built at competitive costs.

There is just one forward shift in the A323 gearbox. The upshift takes place at 15 to 65 m.p.h., depending on throttle position. ("Takes place" should not be interpreted to mean the lessurely ker-

plunk that Chrysler's old semiautomatic box delivered when your foot came off the gas. This job shifts quick and quiet, with no break in the power flow.) The downshift, also dead smooth, is governed by car speed rather than accelerator position, and always occurs as you drop down past 11 m.p h.

When the planetary gears are at the lower speed they have a 1.72-to-1 torque ratio. Multiplied by the converter's 2.6, the whole basket of tricks socks out 4.47-to-1 torque multiplication at breakaway. This is more than any other U.S. automatic transmission with the lever in the Drive position, though others will give

more if you start out in

Low

There is also a kickdown. If you floorboard the accelerator when she's unshifted, you drop back from 1-to-1 to 1.72-to-1 gearing, with correspondingly sharper response. This is one shift that is not dead smooth. You'll readily notice it, even though it isn't like the hiccough of an overdrive kickdown, where the poor engine has to be killed for a split second. Valving of the kickdown servo is set so you can't knock her down above 55 m.p.h. This wouldn't do any harm, but the revs at a

high-speed kickdown would climb off the most useful part of the engine's power curve.

Chrysler is especially pleased with A323's shift pattern. As a drawing shows, a "gate" on the lever's movement lets you engage each range by feel, without checking the pointer. Fast changes for rocking or parking can be done without looking. Neutral is spotted between Reverse and Drive—you don't have to go through a forward gear to back up. It's an easy arrangement to drive with.

There is no Park on the quadrant, a fact that reflects Chrysler's affection for its mechanical hand brake, located just



"NO-LOOKY" shift is fine for parking in tight quarters or rocking mired car: you just lift the lever a bit toward you and slap it up or down. If you don't lift, the gate restricts you to heutral or Drive. As on other automatics, the starter works only in Neutral.



small BUT POTENT, the A323 transmission weighs only 214 pounds, 14 less than the lightest other automatic, which is built to handle 50 less horsepower. Housings and many other parts, including valve bodies, are made of pressure-cast light alloy.

astern of the transmission. Thereby hangs a tale:

In the early days a car's emergency brake was a sort of panic lever to haul back on when the two-wheel mechanical brakes weren't doing the trick, With the coming of four-wheel hydraulics this panic function became less vital, the emergency gave way by imperceptible stages to the parking brake, a device supposed to hold the car put when you left it on a hill.

Pistol-grip levers and Bowden-wire controls—designed for easy release by women—tended to slacken up in time, and by the late Thirties most parking brakes were sorry sisters after they'd had some use, it didn't seem to matter much: when you parked on a hill you always left it in gear to backstop the brake.

This comfortably sloppy situation was upset when fluid couplings and torque converters appeared. Reason: with a liquid link in the power train, there isn't any absolute security in leaving a car in gear. As a result most makers went initially to the Park idea—a pawl or "sprag" that could be engaged to lock the drive shaft positively. This has drawbacks: it is hard to build a pawl that won't sometimes maliciously lock itself in under load; it is costly; and it may need an interlock to keep dimwits from engaging it while the car is rolling briskly, thus munching up the mechanism.

Of COOLER is a small heat exchanger mounted in front of the left cylinder bank. Thermostate governing coolant temperatures effectively control the temperature of oil in the transmission, which is entirely separate from the engine oil.

Chrysler was one company that elected to have none of this. Instead, they concentrated on the brake. The emergency brake on the A323 has, the company claims, the highest holding power in the industry. It will effectively hold the car: on any grade where the rear wheels won't slide. It is an internal expanding mechanical brake mounted at the back of the transmission, where it benefits from the 3.36-to-1 torque multiplication of the rear-axle gears. Being physically separate from the service brakes, it won't be affected by any heating fade that might weaken them, a comfort going down a mountain. The company says it will genuinely function as an emergency brake.

No Extra-Low Gear Ratio

Despite the L on the quadrant, there is no heavy-pull, extra-low gear on A323. When you move the pointer to L you merely lock out the automatic upshift—you get no more torque than you'd have in Drive if you didn't let it upshift. Elimination of the extra planetary gearset and its control mechanisms saves Chrysler both weight and money. Whether there'll be enough moxie to lug an overloaded sedan in prolonged heavy going remains to be seen; Chrysler obviously thinks that its big engine needs no extra assist. The decision to omit this gearset may make more sense when you ponder the big

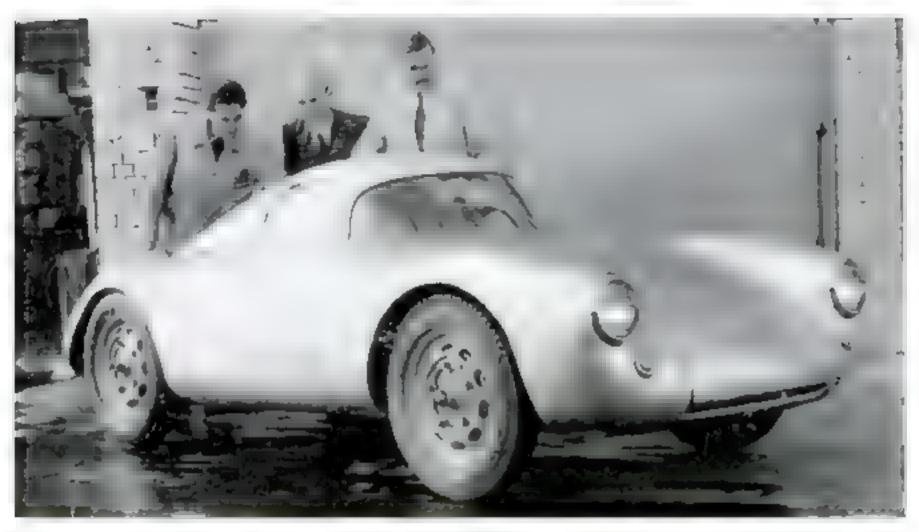


Rebuilt PT Is World's Largest Speedboat

PLATTERING over the waves at 90 miles an hour, a 125-passenger speedboat named the "Flying Saucer" offers vacationists at Ocean City, N. J., the world's fastest regularly scheduled motorboat rides. The designer-operator of the huge spray maker is a local restaurant owner, Chris Montagna, who has been dishing up high-powered hobby boats for more than 20 years.

Chief ingredient of the "Flying Saucer" is a war-surplus motor torpedo boat, completely rehulfed with the exception of her doubleplanked mahogany bottom. The three big Packard engines which drove the PT through hostile Pacific waters during World War II have been souped up from their original total of 4,200 horsepower to 5,400. New hydraulic controls and twin air fins synchronized with her rudders make the "Saucer" as responsive as a marlin on the hook.

To meet excursion-boat requirements, the 75-foot craft has fire-fighting equipment spotted at strategic points below deck, which can be actuated from the control cockpit. She carries three fuel tanks with a total capacity of 1,200 gallons—enough to feed her greedy engines for four hours at full throttle.



New German Sports Car Called 125-Mile-an-Hour Speedster

A RECENT entry in the sports-car field is this Porsche racer from Germany—a more powerful and faster machine than the model previously offered by the same maker. Power has been boosted from 70 to 80 horsepower and maximum speed, it is reported, from about 110 to 125 miles an hour. Body design has been revamped, too, with the result that the new model has a body a few inches lower than its predecessor.



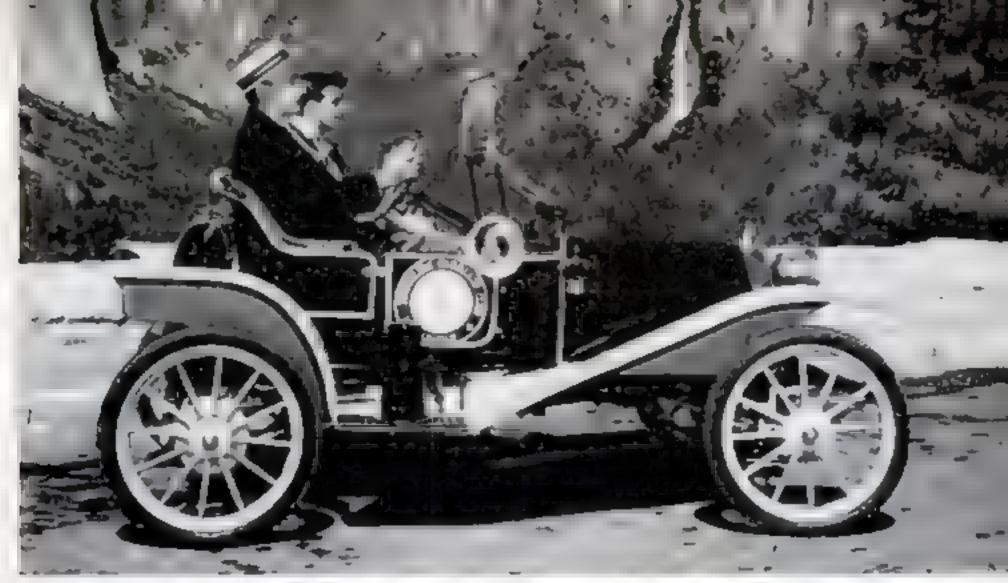
Kids Go for Stationary Car

ALL but one of these small frv are saving in German, "My turn next!" An old Volkswagen body, mounted immobile in a U.S.-sector Berlin playground, has proved a big attraction there. Wheel and horn work.



Speaker Unties Knotted Traffic

Louispeakers help untangle traffic jams, a British trial shows. Above, a policewoman demonstrates a speaker used to direct motorists at Ascot, England, during racing events attracting heavy crowds.



THEM HORSELESS-CARRIAGE FELLERS went and held a contest t'other day t'see how fur they could get on a gallon of vapors. Well, drat me, if John Aghashian, from up Fresno,

Calif., way didn't win with 28.12 miles. That's him, above, drivin' a 1910 Hupmohile, Four-eylinder, it was, All told, they was 93 cars in th' contest.

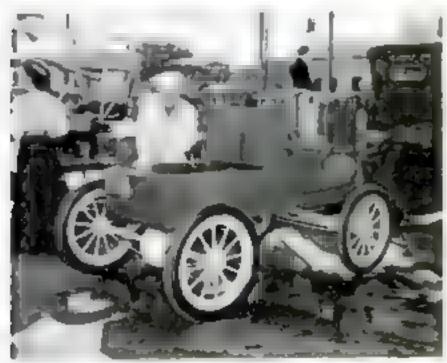
1910 Hup Wins Mile-High Economy Run

Here's Ralph De Palma, th' race driver, helpin' his wife clumb into a 1907 Thomas Flyer.





Right smart drive, it was, 79 miles up to Yosemite National Park. Here's a 1912 Cadillac.



PSHAW! Almost forgot th' oldest car. 'Twas th' 1899 Olds above with $7^{+}{}_{2}$ horsepower.



Won't crank up? Well, git a horse!



Stunt Man Tests New Cable

LEAPING into space from a crane-lifted crate to test a new safety cable, the stunt man above dropped six feet and came to a stop in mid-inr without a jolt. The cable, increasing in thickness as it feeds through a steel ring (bottom of crate), brakes itself.

PPP Raincoats of plastic that keep the rain out, but let the air in, are on the way. In demonstrations, a bag made of the material held water without seepage but allowed smoke blown into it to "breathe" through. Developed by Goodyear, the plastic is called Porolated Vinylfilm.



Blast Produces No Shrapnel

Behind that explosion above, an electric blasting cap has been detonated. Yet only three inches away, a second cap remains intact. It's still in one piece because the caps have a plastic shell that throws off no shrapnel when it explodes.

Dispenser Keeps Desk Tidy

This desk caddycalendar dispenses cellulose tape and a roll of paper tape for notes. A drawer and a well hold rubber bands and paper clips. World Imperial Co., NYC, sells it.



Tweezers Magnify Splinters



Tweezers with a built-in magnifier make it easy to nip out wood splinters, steel or glass slivers. They're handy for fine shopwork, too. Elron Products, Chicago, sells them.

Belt Clip Feeds Out Shells

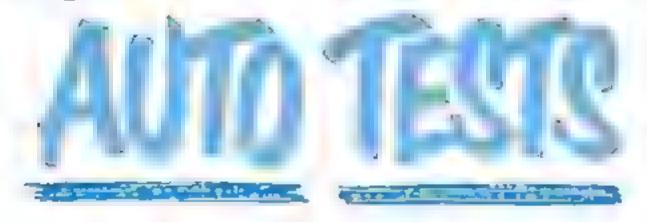
THE cartridge dispenser at right clips to your belt to hold fifty .22's in its clear plastic tubes. A twist of the wrist drops a shell into your hand or directly into a tubular-type magazine. Durden-Fraley Co., Atlanta, Ga., sells the Shell O-Matic.





CAA-RUNCH! goes this unoccupied Buick, rolled at 45 m.p.h. to crash-test its structure.

They Sink Fortunes in



Day and night, Detroit runs autos to destruction in a multimillion-dollar hunt for new-car bugs.

By Frank Rowsome Jr.

WANT to drive around a turn, no hands, at 140 m.p.h.?

Anyone with this unwise urge can satisfy it on a brand-new, multimillion-dollar test track at Chelsea, Michigan—providing Chrysler engineers will lend him their new track for such frivolity.

Chrysler's new high-speed track is a spectacular, elaborately engineered chunk of concrete that makes the famous brick oval at Indianapolis look like a beat-up roller-derby loop. Its sweeping curves are more than half a mile across Each foot of its 4.7-mile length is true to an eighth of an inch. The "superelevation" on the curves (engineers' jargon



As hig as 2,873 full-size football fields, this new proving ground has one of the world's

for banking) is nicely calculated to bal ance out steering forces at 140 miles per hour in the high-speed groove. If you are willing to haul down on the wheel a bit speeds around 200 miles per hour can be racked up

Why should Chrysler, whose bigselling 53 Plymouth has to be flogged vigorously to get over 90, invest so many bucks in a superspeedway?

The reason is that this company, after

vears of doing the job by highway and laboratory testing, is now jumping with both feet into the proving-ground business. Both Ford and GM (which started it back in 1923) and such independents as Packard. Nash and Studebaker have been in the act for years. All of them are making the proving ground an increasingly important part of their research and test programs.

Proving grounds are remarkably big



fastest tracks. Over 20 acres of turf were cut to provide sod for the track embankments.

business Auto manufacturers do not play for marbles. Each model year the balance between hish earnings and sick-ening losses is so delicately poised that anything which can tip the scale is worth big money and manpower. How well the proving grounds have served in this fight can be gauged from their present dimensions

Ford will run 6.400,000 test miles this year at Dearborn, and will keep 300

business Auto manufacturers do not people busy full time at it. They will run play for marbles. Each model year the balance between hish earnings and sick-including 75 cars not built by Ford

GM will clock even higher indeages on its test cars, about 8,300,000 miles this year. At peak times the GM Proving Ground in Milford, Mich., will add 30,-000 miles a day to the speedometers of the ears on trial, and will keep 400 mechanics, engineers and drivers busy.

Or measure it by the real-estate di-



Dust clouds trail an Olds on GM's endurance course. Here 25,000 miles of "accelerated

mension, Ford operates a 360-acre test area at Dearborn, with about 12 miles of varied road surfaces, and maintains garages in Jennerstown, Pa., (for mountains) and Phoenix, Ariz., (for high temperatures). Studebaker's test plant sprawls over 812 acres, with 17 miles of road, GM has 1,268 acres at Milford with 29 miles of road, and has an additional 2,280 acres at the new GM Desert Proving Ground near Mesa, Ariz. At Chelsea, Mich., Chrysler is finishing up the biggest single test ground of them all-3,800 acres of countryside, with 45 miles of road.

Cost figures are played close to the chest in the auto industry. But the observant visitor at Ford's track can guess that the annual budget must be close to \$5,000,000, GM's big Milford operation must bite the bank account for substantially more than that. Chrysler's new layout is planned on the scale of a New Deal dam. (The fence alone around the Chelsea acreage is believed to have cost \$250,000, a full-time forester is kept busy tending the trees; and both the Chrysler and GM grounds have a continuing problem with deer that jump the fence and mosey out on the high-speed track.)

You need more than acreage for a proving ground. Let's suppose that you want to test cars conscientiously, more realistically than can be done with a stop watch, fifth wheel and intuitive seat of the pants. To do an analytical testing job like that done daily by the manufacturers, you'd need to build most of the following roads (and hire a crew to maintain them in the same state of excellence or herror):

 Straightaways, dead level and smooth, for acceleration, fuel and brake runs. Build two of them at 90 degrees to help in wind correction. Make them at least a mile long, and provide banked "turnarounds" at the ends. These will let your test drivers whip into the straights already going at specified speeds.

· High-speed loops, as big and accurately banked as possible, for maximum speed tests and to help pile up hardrunning miles. Better ante up a few hundred thousand dollars extra here to be sure that "track max" won't crowd in on "car max" in a few years. Make the track four or five lanes wide so you can have some vehicles doing brake or transmission runs in the inner lanes while



wear"-much tougher than ordinary mileage-are slapped on a car in a couple of weeks.

others are floorboarded in the highspeed slot.

Better buy yourself a garageful of snow-removal equipment, too—you won't want test drivers wheeling into an icy patch at 100 miles per hour, and you'll be running two or three shifts a day the year round.

 Hills having prolonged grades of 10, 20 and 30 percent are practically a must.
 While you're at it, better also blow your-self to a short 50- or 55-percent grade.
 It'll break the heart of most parking brakes, and froth the juice out of the best automatic transmissions.

 Endurance roads you'll need by the mile. Pick surfaces varying from mediocre blacktop and flaking concrete to washboardy dirt and loose gravel. Be sure to toss in plenty of cobblestones, pot holes and goat trails to boost your "accelerated wear" factor

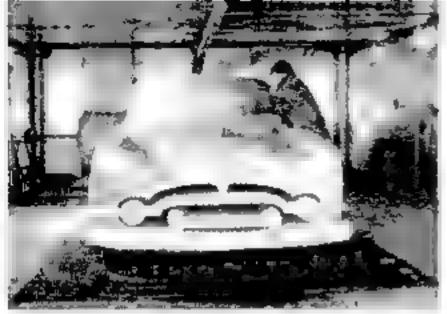
• Dirty-trick roads. Provide a deep water bath, kept just shy of snorkel level. (If you feel extra nasty, make it salt water.) Also build a hog wallow of gritty mud. Harrow it to the consistency where an experienced driver can just barely creep through in low, and keep

the tractor nearby anyhow. Cast a series of staggered concrete billows and space them to give a car maximum diagonal twist. Stake out some railroad ties to whomp a car down on the spring bumpers every couple of feet.

In planning this section, stifle your impulse to sentimentalize a car as a good and loval servant. Instead, think of it as about 3.800 pounds of iron that you propose to maltreat intelligently. And train your test drivers not to wince, as any



PLOSH goes a Packard in that company's deep water trough. This isn't just an electricalsystem test; it checks bearing seals, engine and transmission breathers, air-vent intakes.



COLD ROOM is more than oversize deep freeze. With chassis dynamometer in floor, it permits study of automatic chokes, thermostate, heaters and defrosters, and lube behavior.

mechanically minded guy would, whenever a car gets the whey knocked out of it.

 Special facilities. Since you'll be testing with graduate engineers rather than "feel artists," some engineering facilities will also be required. Lay out a steering serpentine, a "ride-and-handling" course and some skid pads.

Back near the gate, erect and equip a big garage, say, 75 to 100 cars. Staff it with mechanics who can pull a sedan down into 15,000-odd parts and button it up again in short order. Hire a crew of test drivers, passing up car cowboys in favor of the married guys from 25 to 45 who have put in some bus, truck or taxi time. And lay in a stock of bright young engineers, paying them well enough to protect you from raids.

To get full mileage from your engi-

The most interesting man I ever met

Now he funcies himself a flying wing:

Bridged the safety switch on his TV set.

That's what makes him so interesting.

neers, buy a few buildingsful of glittering, costly toys that the breed loves. Things like engine and chassis dynamometers, six

or eight for a start. Four or five towing dynamometers will be handy, as will cold rooms, sound rooms, and a wind tunnel. Not just any old wind tunnel, either, but a full-size, 500-hp. job like Ford's, with a chassis dynamometer under the floor and a refrigerator and heating plant added—so the poor car you're wringing out can be made to cross Death Valley at 80 miles per hour, tow a house trailer up Pikes Peak or make a "cold-soak" run in Brass Monkey, Minn.



NOISE ROAD has dead-quiet surface and sound-reflecting wall close by. This one, at Ford's Dearborn track, is just fine for hunting clusive clicks, trying out muffler "voice."

Don't skimp on the little things like fifth wheels, strain gauges, fuel burettes, decelerometers, superspeed movie cameras and recording oscillographs.

Savvy will be needed along with the instruments, Bill McConnell, instrument engineer at Ford, tells this one: They wanted to find out how road clearance under moving cars was affected by suspension changes. The engineers' eyes lighted up as they figured out how it might be done by bouncing sound, light, radar pulses or even table-tennis balls between car and road. As the talk grew increasingly technical, a mechanic left the group for the garage. There he cobbled up in a few minutes a set of balingwire whiskers, of unequal length, that could be fastened under the car. By measuring the longest wire that wasn't bent back after a ride, he got the an-

> swer easily, and the slide-rule guys had to shelve their intricate dreams.

Better also blow yourself to a complete weather bu-

reau. This is not just to get wind correction on speed and fuel runs, but also because you'll need a continuous, decimal-place record of atmospheric pressure and humidity. To technical men, the crucial test of a test is: can it be repeated at will without significant change? A lot of measurements you'll make are so sensitive that uncorrected weather factors could screw them up.

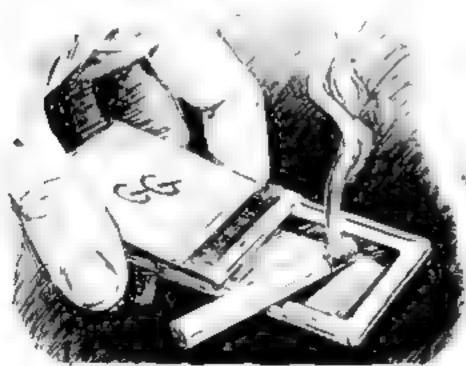
Finally, hire yourself a knowledgeable

[Continued on page 264]

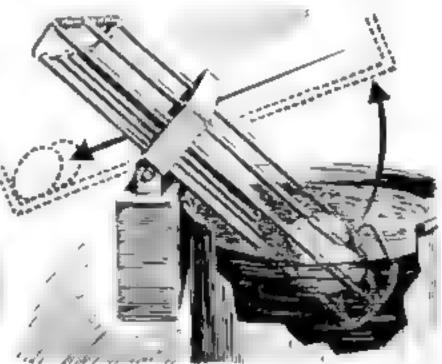


Conveyor to Speed Marketing. Supermarket shoppers wouldn't have to pilot carts or wait at check-out counters in stores that adopted this system. When a customer entered, she would get a clip of num-

bered tags. Every time she selected one or two items, she'd put them in a bucket. Then she would hook the bucket and a tag on a conveyor. By the time she finished, her packages would be collected and priced.

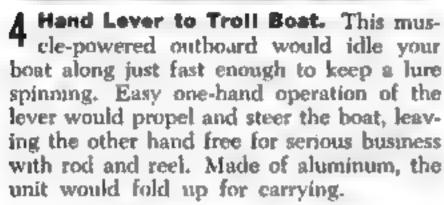


2 Ash Tray to Fit Matchbook. You would never have to hunt for an ash tray if you carried a spillproof metal container like this clipped on the back of a match folder. Whenever there was no other receiver handy, you would slide this one open to dispose of burnt matches, ashes or crushed-out butts.



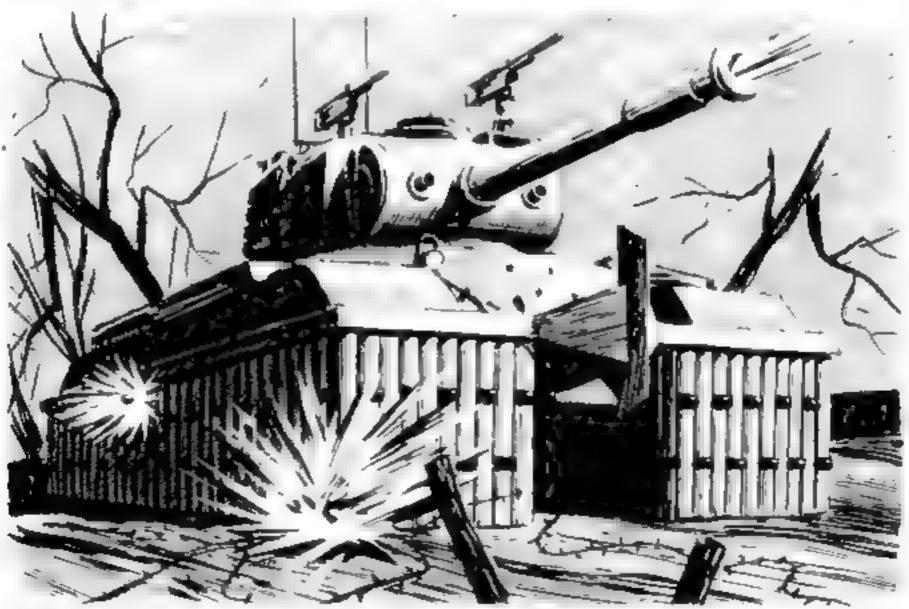
3 Cooker to Time Eggs. You could always be sure of just-right eggs if you had this timer standing guard. A tiltable wire chute yoked to a spring mechanism would suspend eggs in boiling water. At the end of a preset interval, the chute would flop over to lift the eggs out of the water and roll them clear of any rising steam.

MORE New Ideas from the Inventors



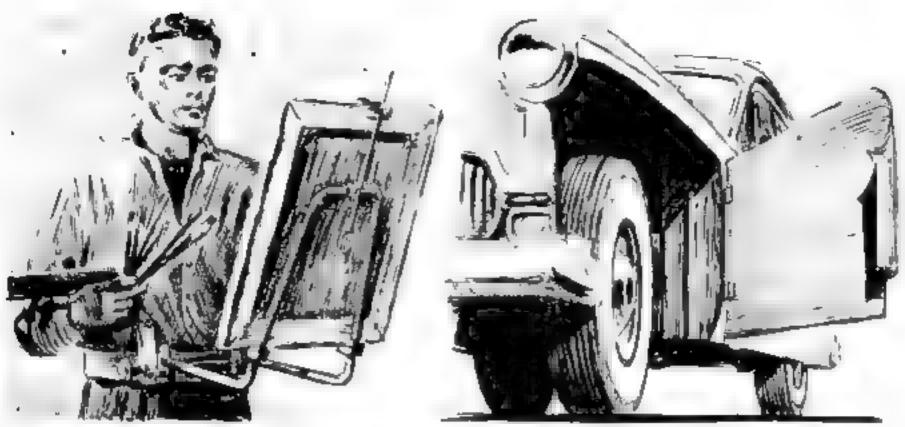


Pedals to Adjust to Car Seat. Moving a car seat forward often crowds a driver against the steering wheel and puts the pedals at an awkward angle. This invention would eliminate such problems. Shifting the seat forward would automatically bring the pedals back. Pedals could operate through flexible hydraulic hoses.



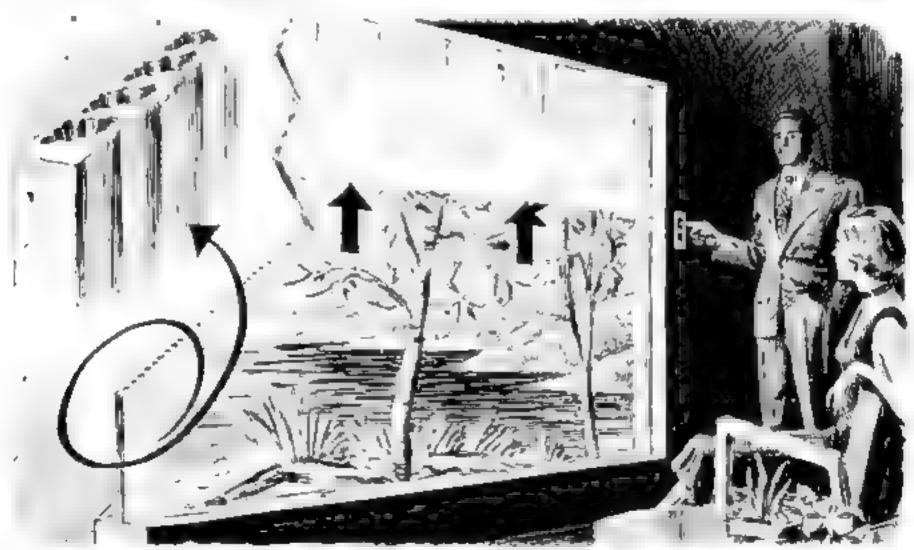
6 Tank Skirt to Sweep Mines. Two rows of light but solid cylinders may give tanks extra armor where they need it most. The inventor of this hula skirt for land cruisers points out that tanks are most vulnerable in the undercarriage, wheels and

caterpillar treads. He says these dangling cylinders could be arranged to form an impenetrable shield and that they would absorb most of the impact of a shell or mine. They would be freely suspended so as not to interfere with the tank's mobility.



7 Easel to Be Worn. The spot that gives an artist the view he wants isn't always the best place to prop an easel. He wouldn't have to worry about that, however, if he wore his sketch pad or canvas in a harness like this. Adjustable for use in a standing or sitting position, the outfit would fold compactly for easy handling.

Hinged Fender to Open Out. You wouldn't have to be an acrobat to change a tire or put on skid chains if your car's fenders swung open like this. Inside access to the fender sides would simplify repair of small dents and scratches. And in case of major damage, being able to replace the panel could save the cost of a new fender.



9 Liquid to Clear or Cloud Window. Pumping liquid between two panes of glass would turn a translucent wall into a clear picture window. Letting out the liquid would "draw the shades," insuring privacy without cutting out light. Small scratches

frost glass and make it translucent. When the scratches are filled with liquid, the frosting disappears. This window would be made of a glass honeycomb frosted on the inside. A pump, and liquid reservoir, would give you push button control.

U. S. potents on these inventions have been granted to: I. R. W. Barrett, Cincinnati, R. R. H. Garber, Minneapolic, S. A. E. Winterling, Long Island City, N. 1., 4. H. Hofman, Minneapolic, S. C. H. Vincent, Acoca, Mich., 6. J. S. Dandine, Rena, Nev., 7. F. A. Bavidson, Stateswille, N. C.; E. L. E. Zabel, Bremerton, Wark., 9. S. De Lisio, Boston.



WILBUR SHAW REPORTS FROM THE DRIVER'S SEAT:

Little British Fords Are

that rolossal air cleaner, but a quieter power plant you never heard. Look at that big, 12-volt battery. It's standard.



A FELLOW took a little, foreign-made car out on a Canadian test track the other day and tried repeatedly to roll it over on its back by cramping the wheels at high speed

No dice. The car was as stable as a pack mule. It kept its feet—with five people aboard

A Ford man told me this story by way of introduction to an automobile that few Americans have driven. It's the Consul, made by the Ford Motor Co. in a London suburb.

I suspect that you'll be seeing a lot of Consuls in the next few months. Together with a sister car, the Zephyr, it's being

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The Zephyr Six, on the left, and the Consul are Ford-made all right but distinctly British.

Rugged, Stable, Economical

imported in ever-increasing numbers for sale to people who want to go farther on a gallon of gas.

These cars are less than average-size. They cost less. They have modest horse-powers. And though they don't look it, they're as underslung as a dachshund.

They fall in the category of the U.S.-made Nash Rambler, Henry J and Willys, and the British Hillman, Austin and other small cars. In weight they're kin to Hudson's undersize Jet.

I've driven the two British Fords. They have a lot to offer besides price.

They're rugged. The Zephyr (the name was borrowed from the Ford-manufac-

tured U.S. Zephyr of a few years ago) won the last Monte Carlo 2,000-mile road race hands down in a finishing field of 101 cars.

They're economical. They get better than 25 miles to the gallon in normal driving. They don't change style each year.

Their inherent stability is due in part to small wheels. Only 13 inches in diameter, they sling the weight low. But more important is the front suspension. Like the Rambler and the Willys, the Consul and the Zephyr hang all the sprung weight on the tops of long coils anchored in the sheet metal itself. The body is a

sort of pendulum between. It makes the cars harder to shove off balance than a circus fat man.

Through the courtesy of Russell Rawlings, Ford dealer in Mt. Kisco, N. Y., and Fine Cars, Inc. of New York City, I wheeled the Consul and the Zephyr over the countryside.

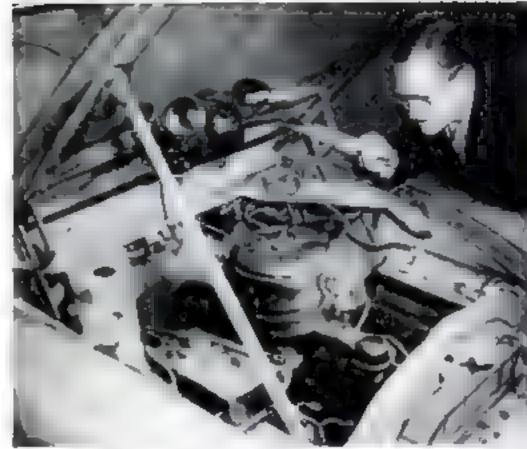
The two cars are just about the same from the windshield back. The Consul has a four-cylinder engine, the Zephyr a six. But such items as pistons, pins, rings and con rods are interchangeable. The Zephyr is a little longer and heavier, a little faster.

Both Cara Excel at Cornering

I took hard turns in both cars. They negotiated them standing up. The first time I got no sway I thought it must be a fluke. But no, the cars are engineered that way.

These automobiles have other virtues. They have the softest clutches I've ever driven. I found out that Ford of England achieved that with a hydraulic booster. It reduces the effort of depressing the clutch by half.

The engines in both cars are as up-todate as today's newspaper. They're "over-square." That is, their bore is big-



THE ZEPHYR has more omph, and the engine compartment reflects it. The hatters is forward in the wind stream for extra cooling. The windshield wipers are constant-speed.

ger than their stroke. And there's a story behind that.

For years the British government taxed cars on what was known as an RAC (Royal Automobile Club) rating. To arrive at the tax on any car, the collector took the diameter of the cylinder bore, squared it, multiplied by the number of cylinders and divided by the fixed figure of 2.5. Naturally, that led to a rash of

FACTS ON ZEPHYR SIX AND CONSUL

(The following specifications apply to both cars except where star (*) indicates that Consul differs. Separate Consul specifications at end of box.)

Model: four-door sedan.

Engine: 6-cyl. (*) overhead valve; 68 hp. (*) at 4,000 r.p.m. (*); compression ratio, 6.8.1; piston displacement, 138 cu. in. (*), piston travel (in feet per car mile at 20 m.p.h.), 1,872 (*), bore and stroke, 3.12" by 3"; torque, 112 lb.-ft. at 2,000 r p m. (*)

Weight: 2,604 lb. (*), per hp., 38.3 (*). Transmission: three-speed synchronicsh:

rear-axle ratio, 4.44 1 (*).

Steering ratio: 13.6 1, radius of turning circle, 20 ft.

Effective brake-lining area: 121 sq in. Springs: front, coil; rear, semi-elliptic.

Outside dimensions: height, 61", overall length with bumpers and guards, 171" (*), width, 64"; wheelbase, 104" (*), overhang, front 36" (*), rear, 36"; tread, front 50", rear 49".

Inside dimensions: seat-cushion width, front, 52h", rear 53h"; leg room, front 42", rear 34", headroom, front 36h", rear 35h", seat height, front 12h", rear 12h", vertical distance, steering wheel to seat cushion with seat in mid-position, 5", front seat adjustment, horizontal 5", vertical 0".

Tire size: 6.40 by 13 (*).

CONSUL

Engine: 4-cyl. overhead valve; 47 hp. at 4,400 r.p.m.; piston displacement, 92 cu. in.; piston travel (in feet per car mde at 20 m.p.h.), 1,970; torque, 74 lb.-ft. at 2,400 r.p.m.

Weight: 2,350 lb.; per hp., 50 lb.

Rear-axle ratio: 4.55.1.

Over-all length with bumpers and guards, 164%"; wheelbase, 100"; overhang, front, 33".

Tire size: 5.90 by 13.



small-bore, long-stroke engines to save taxes.

Recently the British have changed the tax laws. Now motorists are charged the equivalent of \$28 a year irrespective of engine dimensions. Ford promptly took advantage of the change and boosted the bore of its British-made cars.

The big-bore, short-stroke engines permit the use of larger valves. That means better "breathing" capacity—the air-gas charge gets into the cylinders more easily and the burned gases get out faster. It also lowers piston speeds, and that results in less wear.

Only the newest and most expensive of U.S. cars have over-square engines.

The Consul and the Zephyr bear only a second-cousin relationship to the Fords made in this country. Their basic engineering was done in Dearborn, home

of the Ford industrial empire, but they are distinctly a British product.

Nor should they be confused with those other two British-made Fords that for years got short shrift from U. S. buyers—the Anglia and the Prefect, Those two numbers, still being made, are austerity cars.

The Consul and the Zephyr have onepiece curved windshields, ventilating and heating systems equal to any in a medium-priced U. S. car, squeakproof coachwork that doubles as frame and body, king-size brakes, big luggage compartments and—if you wish—beautiful leather upholstery as only the British can turn it out.

And don't sell either car short in the speed department. The Consul will cruise nicely at 60 and top 70. The Zephyr will cruise at 65-70 and top 80.



SHRIEKS FROM THE AIR SIREN above this crystal jac shoot through a sea-water solution in the flask. Duration of sound's life helps determine how chemicals blot up sound.

Bottled Sound Tells Sea Secrets

THE University of California scientist at left is trapping sound in a bottle of water. He's hoping to answer a question linked to the Navy's problems of underwater detection with Sonar: Why does sea water absorb more sound than fresh water?

The three-gallon bottle holds synthetic sea water. Sound waves shooting through the solution disturb the chemical equilibrium between the magnesium sulfate groups and magnesium and sulfate ions in the water. By measuring the rate at which the sound dies away, the scientists determine which chemicals absorb the most sound.

Now a Plastic Saddle

Jockey Eddie Arcaro boots home the gee-gees mounted on a one-pound saddle of vinvlite on a leather base, at right. As it warms up, the plastic resists slipping, and in wet weather it sheds moisture. Ordinary saddles can soak up two or three pounds of rain water.



Building Breathes in Tons of Air Without a Gasp



suffer. Even electronic instruments were unable to pick up any noise.

A silencing system, comparable to those used in jetengine test cells, has been built between the 70-foot air-conditioning louver and seven giant blowers that draw

A BABY tomado—200,000 cubic feet of air a minute—is sucked through the huge louver on New York's Lever House, at left, But the ears of Park Avenue neighbors don't

in the big breeze. Industrial Acoustics Co., NYC, designed the silencer, using acoustic panels and resonators.

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A CARD IS THE KEY (right) to an untended parking lot for 160 cars on Lake Shore Drive. Tiny metal disks in one end of the eard fit an adjustable grooved slot in a hooded box. Once inside they complete an electrical circuit that causes a gate (above) to be raised.

The Robots Run Parking Lots

On 30 parking lots in Chicago, electronic watchmen are collecting fees and opening barriers to let cars in and out. Exits as well as entrances are guarded so that drivers won't be tempted to ride in through an exit and park free.

Three types of electronic gate tenders, in use at three different lots, are shown in the photos.

coin-operated platforms slide incoming cars to right so they can bypass barries. When car drives off, electric eye causes motorized plutform to shift back where it started.

The card "key," shown above, costs the parker \$12.50 a month. The "tumblers" in the control box are changed and new cards are issued every 30 days. The sliding platform below rides on rails, powered by a two-horse power electric motor beneath it. It shuts off automatically when the lot is filled, and starts operating again when cars leave.

A QUARTER LIFTS THE GATE at the Winthrop St. parking lot below. Once a car has passed through an electric-cye beam at the lot entrance, the gate comes firmly down again.





Meet Mr. Guided Missile

Young Nevin Palley, designer of push-button weapons, is also a mighty handy man around the house.

By Herbert O. Johansen

IT WAS a hot, humid day in Dallas. We were sitting in the shaded kitchen of 38-year-old Nevin Palley's suburban home.

Palley had designed and built the handsome wooden table on which an assortment of crackers and cheese lay before us. He had also designed Regulus—the Navy's new guided missile that can be launched from a submarine and has a built-in electronic brain to seek out and destroy a target.

For the table, Palley told me, he had used only hand tools. He finds them more relaxing than power tools. Perhaps that is because in designing missiles he works with the most complex tools in the world—people.

Palley feels that there was a time he wouldn't have been able to do the job he is doing today as chief of missile design for Chance Vought, with some 600 engineers under him. That was when he was more interested in things than people. Then he learned that all companies have the same engineering data, laws of physics and slide rules, but that it takes people to make them work better.

Now he puts people before things the people whom he credits with the success of the Regulus missile. And it may be significant that in his design work he uses a small, six-inch slide rule putting "things" in their proper place.

It was a strange setting for an inter-

DUTCH CUPBOARD was built by missile-designer Palley with hand tools. He also is handy with the chafing dish and can cook up a Welsh rabbit that is something special.

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Son John looks on as Daddy puts the finishing touches on model of an old Curtiss pusher.

view with a guided-missile mastermind. We were surrounded, not by scientific apparatus, but by kitchen appliances intended to give a mother more time to devote to three small children and a lush garden of gardenia bushes, roses and petunia beds. And the mother, pretty and cotton-cool Mrs. Palley, was there. So were the children, six-year-old Mary in-between John and two-year-old Richard. Elmer, a frisky Boston terrier, completed the company.

Nevin Palley spends only about a fourth of his off-work time at home—and this was part of that precious time. They weren't going to miss a moment of it. In fact, it was only a few months ago that Mrs. Palley, like the wives of all the

workers on the new Navy missile, learned what her husband had been doing away from home and working nights since 1947 when the project started.

Nevin Palley is no long-hair. He wears his dark hair in a crew cut that makes him look younger than his 38 years. He is slim, erect and tall, and distinguished by an intense, alert look.

His features give a clue to his ancestry. His Russian-born father came to this country in 1890, and today, at 70, is still active in a successful metal-cabinet and kitchen-equipment business in Pittsburgh, where Nevin was born on April 12, 1915.

Although Palley became interested in aviation as a youngster through model-

plane building and reading about Lindbergh's epoch-making flight across the Atlantic, the die of his career wasn't cast so easily. Young Nevin wanted to be a doctor; a scholarship to Carnegie Tech while he was in high school indicated engineering.

First Engineering, Then Pre-Med

He accepted the scholarship, but after two years decided that engineering wasn't for him. He quit and took half a year of pre-med. That made engineering look so good that he returned to it, graduating from Carnegie Tech in 1937. By that time aviation was in his blood. He had done wind-tunnel work, designed and flown sailplanes and worked during vacations in aircraft factories.

His first job was with Lockheed in Burbank, Calif. As an aerodynamicist he did performance curves from other people's calculations. He wanted more creative work and got it on the XP-38, the forerunner of the famous World War II

twin-engine Lightning fighter.

An opportunity to work on new wing shapes that were just then being developed to lick the problems of higher speeds took Palley to North American, another California firm.

He liked life on the West Coast, but the magnet of new experience drew him to Curtiss-Wright in Buffalo, N. Y. That was in 1939. There he got a chance to do original design on the XP-60, the first airplane to use a laminar-flow wing. He also met his wife

The summer of 1941 saw him, now married, on the move again—seeking new aerodynamic challenges. At Stratford, Conn., he knocked on the door of James Shoemaker, then chief project engineer for the Chance Vought Aircraft Division of the United Aircraft Corp. After two hours he came out and told his wife that they had found a new home. He had decided to stay in exchange for a promise.

Becomes Head of Design Group

The promise Shoemaker had made was that if Palley came through on some more or less routine work he would be made head of the preliminary design group. At the end of six months he got the job and his big chance—original studies on the military versions of the experimental Flying Pancake that scared the pants off many a Connecticut farmer and gave rise to numerous flying-saucer reports during its test flights. It was allnew and unconventional in power plant, wing and general configuration. Next came revisions and improvements in the Navy Corsair

At about this time early jet studies were being made by Palley's group. The



PALLEY'S BABY, Regulus, resembles a small, conventional, swept-wing jet airplane. This new Navy guided mussile is about 30 feet long and can carry a powerful warhead.



ROCKET BOOST is used to launch Regulus guided missile from deck of the aircraft cartier Princeton. Many test missiles have been flown at speeds faster than that of sound.

studies culminated in 1946 in the development of the high-speed, swept-back tailless Navy Cutlass twin-jet fighter.

Again Palley was faced with no challenge to satisfy his creative urge. He felt that the Cutlass was the ultimate design in piloted jet carrier fighters—that he had gone as far as he could along that line. Fortunately, at about that time "liberated German data" was being made available

-meaning guided missiles.

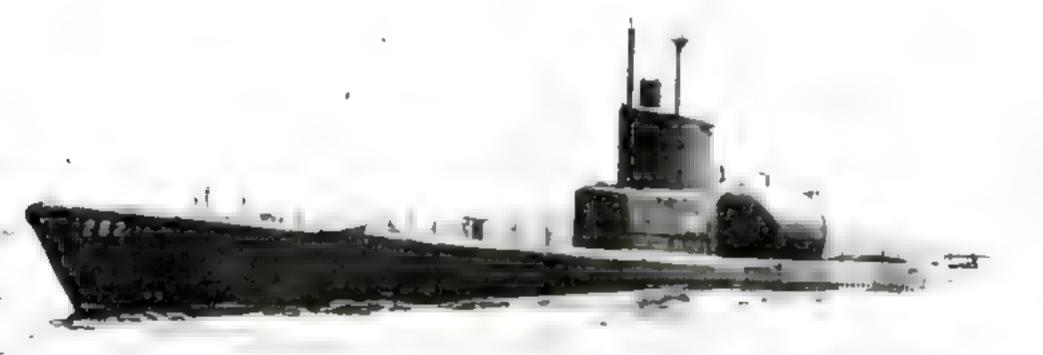
When Chance Vought embarked on guided-missile studies for the Navy, Palley initiated the work and injected himself right into the middle of the project. His request for permission to follow through was granted, and so, with a small group of about 30 engineers, he nursed Regulus from its infancy to the recent dramatic debut when it was fired from the carrier *Princeton* at sea near San Diego, Calif. During that time Chance Vought had moved from Connecticut to Texas, in one of the greatest mass-moves of industry.

Whether Regulus actually has been fired from the submarine Tunny, modified to launch it, had not been revealed at the time this was written. But that is its design destiny, says Palley: a combination strike at the enemy—the surprise of a submarine plus the high-speed penetration of the missile.

Careful to avoid any personal ac-



clims of Regulus is almost straight up. Test versions have tricycle landing gene so that missiles can be recovered and their recording instruments studied.



SUBMARINE TUNNY has been specifically modified to fire the Regulus, A short-rail launcher has been installed on the afterdeck, Tanklike object just behind the conning tower is the

guided-missile hangar. A World War II submarine, Tunny also has been modernized by the addition of a snorkel and streamlining of the bull and conning tower.



THE PALLEY FAMILY at home (left to right):
Mrs. Palley, John, Palley with Richard in
lap, and Mary. The home photos were taken
by Wayne Sanford of Chance Yought.

claim, he points out that any modern airplane or missile is so complex that no one individual can be given credit for its development.

He Gathered the Right People

"For my own part," says Palley of Regulus, "all I did was to gather together the right people and try to stimulate them."

An example of how well he did that job is the case of Samuel Oliver Perry (a descendant of Commodore Perry), the man who has personally directed all Regulus firings and is credited with much of the success of this missile. Palley found him in the "mold loft," where tool templates are made, recognized his ability and drafted the young engineer for Regulus. In charge of all test evaluation on the missile, he spends most of his time at Muroc Dry Lake in California, where he has become known as "Seven-knot" Perry. Palley won't vouch for the story of how Sam came by the name, but here is how it is told:

Early-morning test launchings of Regulus were restricted to a seven-knot wind limitation. As tests progressed, however, Perry's estimate of wind velocities became increasingly flexible. One day the winds across the dry lake reached a howling 60 knots. Perry, anemometer in hand, was seen literally leaning into the teeth of the gale.

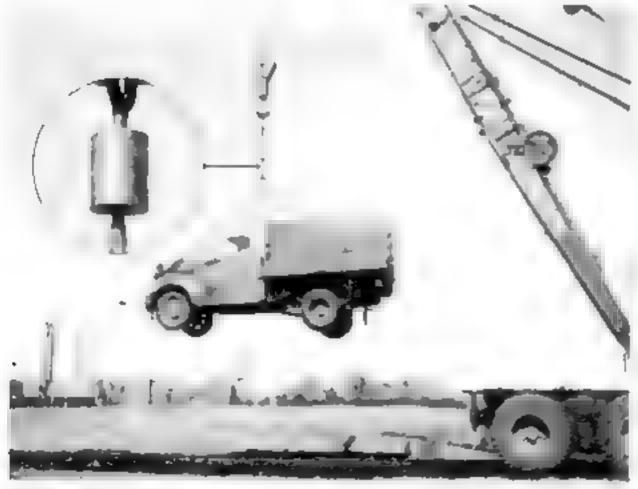
"What's the wind?" he was asked.

"Seven knots," he replied without hesitation.

Now that it can be told, Palley and his wife, when urged, will entertain their friends with anecdotes like that about the trials and tribulations of guiding a guided missile through its days of secrecy.

[Continued on page 244]

New Glue Makes Link That Lifts 5,000-Pound Truck



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To FORM a connecting link in lifting the big truck at left, two steel blocks, four inches in diameter and with machineground surfaces, were bonded together with an adhesive called Pliobond (see blown-up inset). After being used in the truck-lifting demonstration, the same two blocks. still bonded together, supported a weight of 19,150 pounds in a laboratory experiment. Goodyear Tire and Rubber Co., maker of Phobond, claims that the adhesive will "bond anything to anything."



the showed the mostic landscape that the lungr s this ers would can

There are a few det ls to be an aged first such as bridge an orthod satellite as a verstation in space I or dillion fell us five natura tens of fuel, and I 000 trips by 86 king size reckets shock take care of that Models showed a fem section resket fucling for take off center and its natern bet tom view), with cruches for use court gardener from



Trim Board Has Rotary Cutter

A SELF-SHARPENING wheel is the cutter on this trim board. Riding along an I-beam track, the wheel, replacing oldtype chopper blade, cuts paper, film, plastic and other sheet materials. Made by Zeus Rolcut Co., Sausalito, Calif.



Makes Coffee as You Drive

The young lady is enjoying a cup of coffee made by a German gadget that clamps onto the dash and plugs into the car's electric system. Hot water filters through powdered coffee into a cup. Cuno Sievers, NYC, distributes Paluxette.

Cowboys Now Ride Copters

THERE'S a new cowhand on one of the Lone Star State's largest ranches. It is a helicopter that flies the range of the Waggoner Estate's Zacaweista Ranch, a 500,000-acre spread across six counties in north Texas.

During roundup time, in heavy brush country, the Bell copter does the work of 15 to 20 cowboys on good horses. That is the estimate of Tony J. Hazlewood, veteran foreman of the ranch who flies with the pilot, working in front of the horse-borne cowboys.

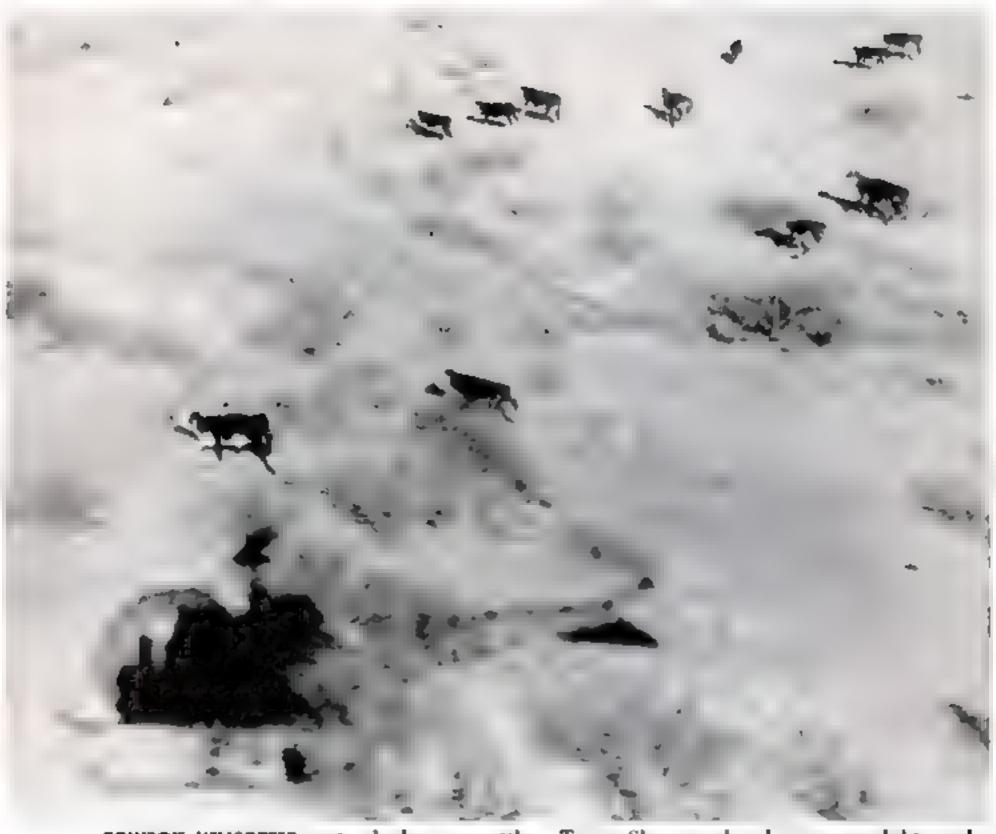
After flushing the cattle out of the thick, matted brush where they are difficult to reach on horseback, the copter maneuvers to help the cowboys bunch them into a fence corner for branding.

Between foundups, the helicopter is kept busy on many other jobs, such as riding the ranch's 2,700 miles of fence, patrolling water tanks, wild-game surveying and acrual warfare on predatory animals.



READY FOR ROUNDUP operation, ranch-foreman Hazlewood climbs into the copter. Pilot Sherman Kennedy is at the controls.

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COWBOY HELICOPTER casts shadow on cattle range of Zacaweista Ranch, near Vernon,

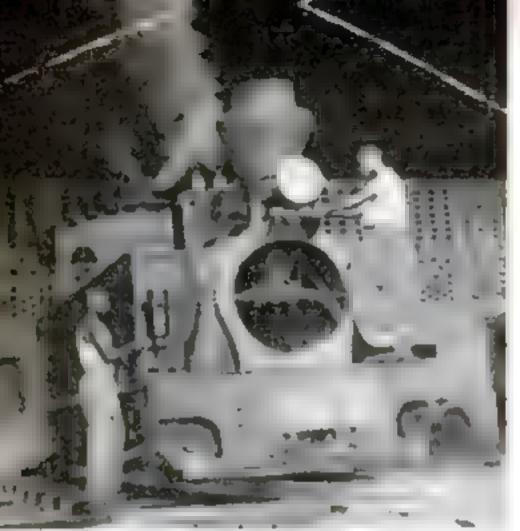
Texas. Slow speed and maneuverability make rotary-wing aircraft good cattle herders.



SMAIL SHED houses the easily handled, ranchriding egg beater. Note the Waggoner Estate brand on the helicopter's task surface.



MELICOPTER has helped these grounded cowpokes to drive cattle into a fence corner for branding and handling.



DIESELS will soon replace antiquated little Belgian-built side-tunk switchers.



Railroad

By Henry B. Comstock



Jigsaw puzzle of midget lines will soon wheel the wealth of the Congo down to two oceans.

In 1485, a Portuguese navigator named Diogo Cam sailed boldly down the west coast of Africa to the mouth of the Congo River. Forcing his way some 90 miles up the great brown stream, he discovered what has been bothering African explorers, industrialists and military men ever since—32 thundering rapids and cascades that bottle off thousands of miles of jungle-piercing, navigable waterways to the east.

Today, nearly a million tons of freight a year must be portaged around those rapids of the lower Congo on a busy little railroad whose gracefully sprung viaduct and tunnel arches, spit-and-pohsh trains, and tile-roofed, yellow brick stations might well have been ordered from the latest toy-train catalogue.

Although this Matadi-Leopoldville Railway has brought you the makings of many a bar of Lever Brothers' soap, chances are that you have never heard of it.

In another five years you will. For this tiny picture-book railroad of west Africa is destined to play as important a part in your world of tomorrow as the Pennsylvania Railroad or the Union Pacific system does today.

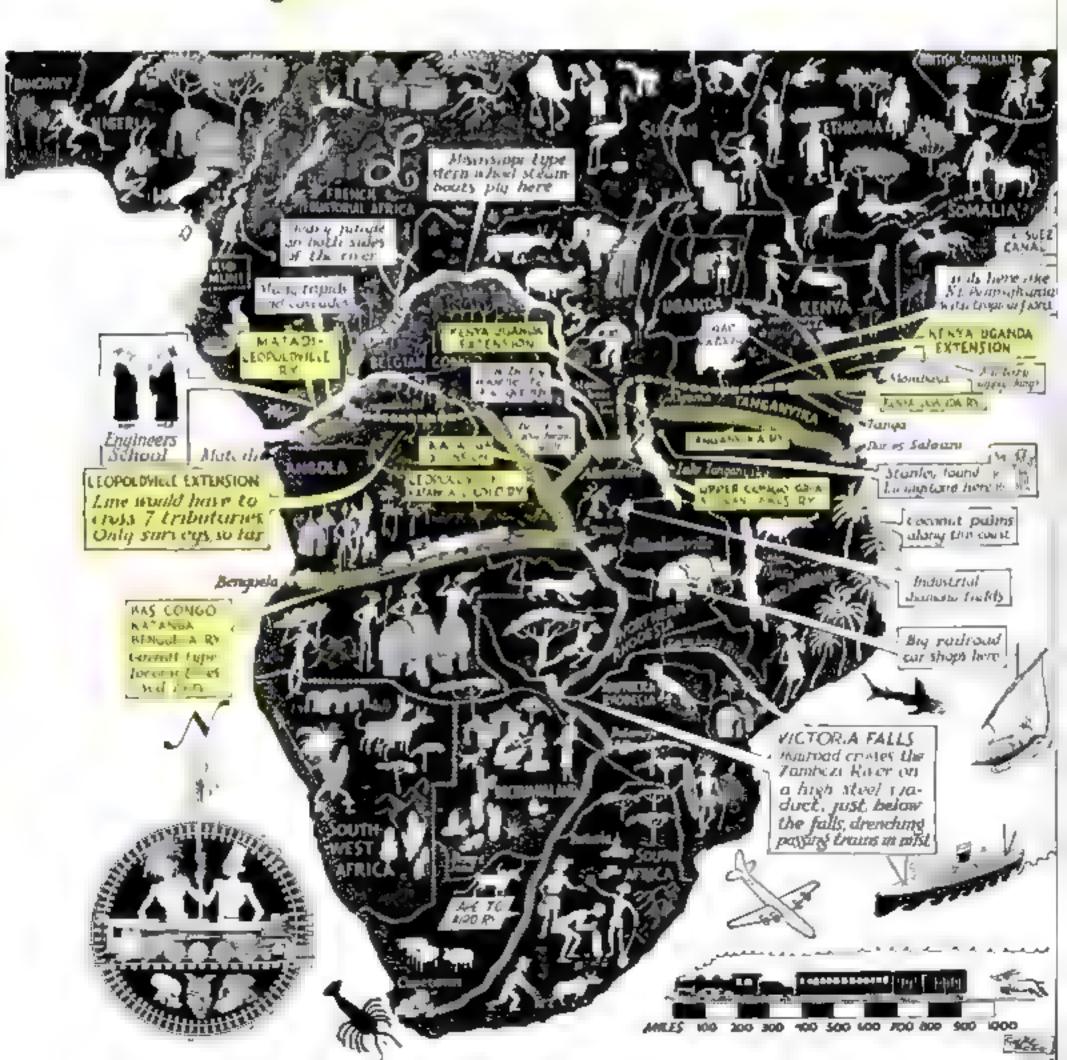
If you don't believe it, take a look at the map of Africa which appears on the facing page.

Just south of the equator, and midway across the continent, there is a spot in the Belgian Congo where Geiger counters chatter like a set of false teeth shaken by tropical fever. This is Katanga, under whose parched hills lies half the earth's known store of tranium. Thrown in as attractive side dishes are enough copper to supply all the world's needs for the next 200 years, the reserves second only to those of Malaya, great iron deposits, Africa's largest industrial diamond fields, and a liberal sprinkling of zine, cobalt and magnesium.

An all-rail line driven from this equa-



Across Africa to Tap Hidden Treasures





MATADI-LEOPOLDVILLE RAILWAY used plenty of Belgium brick to give stations the thatched-

roof look of native huts. Operator, upper right, sends call to next station, requesting

torial treasure house to the Falls of the Congo and the Matadi-Leopoldville Railway would become a vital link in one of the world's most important traffic routes.

But that is only half the story. Directly across Africa to the east of Matadi lies the great British military supply base of Mackinnon Road, in Kenya. To reach this hot spot on the Indian Ocean, all present shipping threads the Suez Canal. Cut off the big desert ditch, as Egypt has been threatening to do, and there isn't a single trans-African railroad that could be used to bypass the Suez. All heavy war matériel would have to be shipped around the Cape of Good Hope to reach Mackinnon's nearest harbor—Mombasa

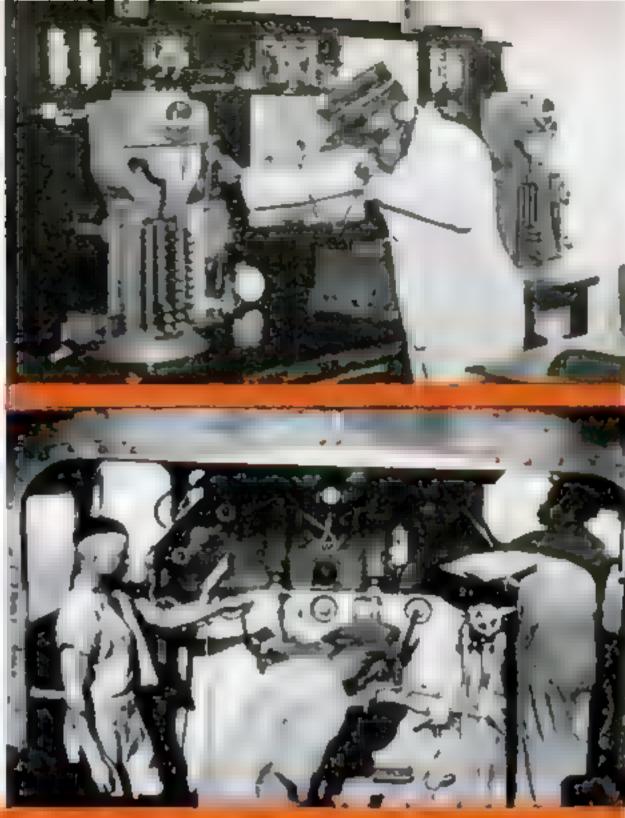
Now look at the map again. A railway line from Matadi to the mining district of Katanga could carry troops and supplies halfway to Mombasa. Link such a system to the British-owned railways in east Africa and you'd have a reasonably direct transcontinental line, one which would eliminate 6,000 miles of deepwater navigation.

That, in an African walnut shell, is what the Belgians and British have set out to do—to tie five (possibly six) existing railroads into a heavy-duty, through rail route from coast to coast. Already,

We'd Call It a "Hayburner"

GRANDS LACS RAIT WAY engines burn wood, a fact one U.S. manufacturer forgot when building engines for the line Natives must be sharpshooters to pitch logs through their coal-type fire doors





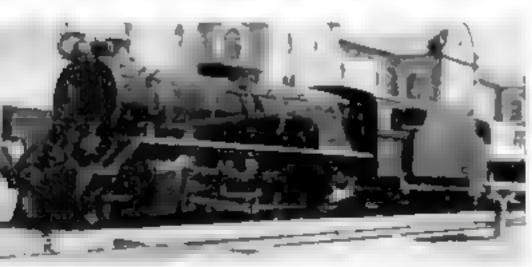
signal staff from machine at his left. If line is clear, signalman there presses button which

releases it electrically, giving enginement above authority to highball.

more than 900 miles of connecting lines are either being built or surveyed in the Congo's steaming jungles and broad savannas. Another 800 miles will be projected if the British go ahead with plans for a new railway across equatorial east Africa.

To see how the huge jigsaw puzzle is shaping up, let's have a look at the completed segments. They are:

The Matadi-Leopoldville Railway.



• The Bas Congo-Katanga, Benguela Radway

- The Leopoldville-Katanga-Dilolo Railway.
- The Upper Congo-Great African Lakes Railway
- The Tanganyika Railway.
- The Kenya-Uganda Railway.

The Matadi-Leopoldville is the key to the projected network. The hazards that were overcome in building it, however, explain why you can stand at a point in Africa—fortunately, not along the proposed trans-African route—which is as far from a train whistle as Chicago is from Hudson Bay, the Gulf of Mexico, New Haven, Conn., and Dodge City, Kan. Each 623 feet of the Matadi's 227-mile length claimed a Belgian or Congolese life before the line reached Leopoldville in 1898. The road cost more

than twice as much to build per mile as Colorado's comparable narrow gauges, and was cited as a classic example of the folly of driving iron in the tropics.

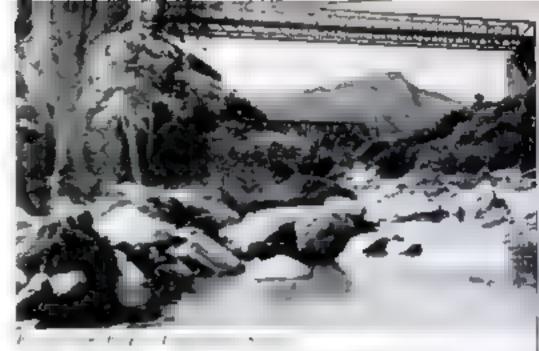
Today, all that is changed. Up-to-date machinery, and the amazing ability of the equatorial African to operate it skill-fully, have done the trick. Your modern Congolese is an artist with a Bucyrus-Erie electric shovel, and an even better railroad man. Give him the kind of training the Matadi-Leopoldville offers him in the company's school at Cattier, and he will learn as much about fuel economy and diesel circuits as any hogger on the Denver & Rio Grande Western.

No befeathered chieftain of Henry Stanley's day was prouder of his blowgun than the dark-faced engineer of the 11-hour "express" between Matadi and Leopoldville is of his shiny new diesel locomotive. He is a man of affairs in his community. So are the 35 native station-masters who maintain the most immaculately clean stations in Africa or any other continent.

The Bas Congo-Katanga, Benguela Railway is one of the longer railways that can be tied into the trans-African route. In 1873 a young Englishman, who had been sent to South Africa for his health, stumbled onto the Kimberley diamond fields. Crystallized carbon is a great healer, and when he died, in 1902, Cecil Rhodes had driven his famous "Cape-to-Cairo" northward through the Dark Contment almost to Victoria Falls. With an eve for the vast mineral wealth of the Congo he had already offered King Leopold II, sovereign of the Congo Free State, a 60-percent cut of the earnings of a British-built extension of the Capeto-Cairo, which he proposed to push across the Congo to the Sudan.

That Belgian Congo link was finally built. But it was not the one that Cecil Rhodes had planned. Katanga's ore exceeded even his wild dreams, and called for a speedy outlet to the sea. Today the Belgian extension swings off to the west in two great forking arcs, to carry close to five million tons of ore, an-

[Continued on page 252]



FIRST BRIDGE on the trans-African radway will be the through-truss span in the background, which crosses the River WPozo cast of Matada, 90 miles from the Atlantic.



DIESEL SWITCHER works the docks at Leopoldville, where freight is transferred from Kasai and Congo river steambouts. Rads will eliminate 550-mile water hank.



indian ocean terminat of the trans-African rail route will be Mombasa, near British military base of Mackinnon Road. Tracks of Kenya-Uganda Railway must be widened to 3'6".



Two triangular engines power this fast British patrol craft, formerly a German gunboat.

Triangle Engine Packs Power

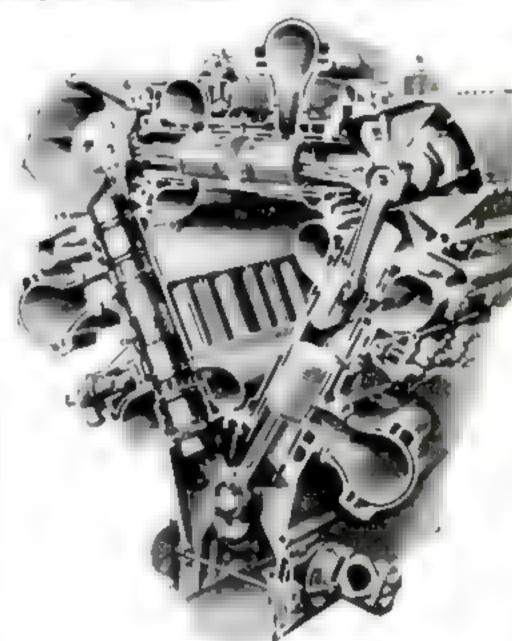
THE British Navy asked for a compact, lightweight engine to power fast patrol boats. What it got is a completely new diesel unit. Called the Deltic, after the Greek letter delta, it has 18 cylinders arranged in six triangular banks of three each.

Delivering 2,500 horsepower at a weight of 4.2 pounds per horsepower, it weighs 10,500 pounds, is only 11 feet long, about six feet wide and seven feet high. Nupier engineers, who designed the unique two-cycle engine, believe that it has a future not only as a marine power plant, but as a stationary engine, for locomotives, and even in

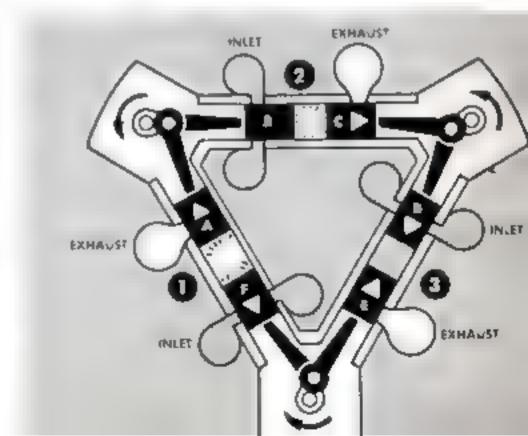
The photograph and drawing at the right show how it works. The Deltic has three crankshafts at the corners of a triangle whose sides are the cylinders. Each of the cylinders is equipped with two horizontally opposed pistons.

In the drawing, cylinder I has just fired, cylinder 2 is firing and cylinder 3 is about to fire. One piston in each cylinder controls the inlet port and the other the exhaust port. The exhaust pistons have a 20-degree crankshaft lead, so that they open and close their ports earlier than the inlet pistons do theirs. Thus, exhaust pressure is released before a new charge is introduced.

The crankshafts are geared together to drive a single shaft that transmits power to the propeller.



cross section through one bank of Deltic engine's cylinders is shown above. Below is sketch showing how opposed pistons behave during closed-cycle firing sequence.



SEPTEMBER 1953 |53





TV Moves in on 3-D - Camera Sends Two Pix, Eye Sees One

TV has invaded 3-D. On test programs, ABC has alternately telecast scenes as they would be seen with the left and the right eye. A rotating disk—half clear plastic, half mirrored—is set up before the camera (above left). A direct shot is taken through the clear plastic; then an image, bounced to the mirrored half by a second mirror three

inches to one side, is photographed. Every 60th of a second, a picture appears on an alternate tube of a twin-tube receiver (above right) and is projected through its own polaroid filter onto a screen. A viewer with polaroid specs sees one picture with one eye at a time, but the brain holds the image and fuses it with the next one.



Switch Swallows Lightning

HERE'S a knife switch that can handle 330,000 volts or withstand the sudden power surge of a 1,300,000-volt lightning stroke. Biggest disconnect switch ever built by Westinghouse, it will isolate high-voltage lines for inspection and maintenance.



Ship Painters Roll It On

They're painting ships now just the way you paint a bedroom wall—with rollers. The 18-inch wide rollers cover the surface fast, and long handles save the time needed to rig scaffolds. The high-pile lamb's wool is fixed to a Bakelite-impregnated core.

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Fire fighting rather than football enlivens

America's Biggest Engineering School

Illinois Tech is young but gigantic. You don't need a rich uncle, but it does take brains and hard work to earn your degree there.

By Martin Loveland

THE biggest engineering school in the U.S. is only 13 years old. Born of a union of much smaller schools. Illinois Institute of Technology for the last seven years has been turning out engineers faster

than 193 other accredited schools to meet the country's serious shortage. Last year, Illinois Tech had 4.621 undergraduate and 920 graduate engineering students, topping Brooklyn Polytechnic, Purdue, M.I.T. and other renowned contenders.

It can no longer be confined to the

At Illinois Tech You Can Go to Blazes for Credit

Among the subjects in which Illinois Tech awards degrees is fire protection and safety engineering. The pictures below show students in the course on a field trip last spring to the Ansul Chemical Co., Marinette, Wisthey put out 75 sample fires in two days.



Teacher uses dry chemical against small fire.



Students douse flames of escaping propane.



Spray beuts back gasoline blaze in open pit.

seven acres of Chicago's South Side where it began life in the broiling summer of 1940. There today a modern metropolitan college campus of 110 acres is being hewed out of a decayed area where desperately poor families are crowded into crumbling mansions that once belonged to meat-packing kings and railroad builders.

Buying room for the school to grow in and equipping it with new laboratories and classrooms and dermiteries already has cost more than \$10,000,000. To complete the school's grand plan, \$20,000,000 more must be spent. Most of the land needed has been purchased. Fourteen of the buildings are already built and in use, with 48 still to come.

Night Owls Outnumber Day Students

Illinois Tech hes about 15 minutes south of the Loop by the fastest of several types of available transportation. Three-fourths of its students live in Greater Chicago and commute to classes. Two-thirds of them have regular jobs and go to school at night.

A high-school student who wants to go to Illinois Tech must be in the top half of his class and pass an entrance exam, but insufficient funds need not discourage him.

Two- and four-year scholarships are available in such unusual fields as fire protection and safety engineering, gas engineering, and food engineering. But most of the 400 day students who are receiving some kind of financial help are getting it through a special work-study program that Illinois Tech has arranged with 35 to 40 nearby industrial firms. Under this plan, a student attends school for a semester, then works for a company the following semester, thus earning all his college expenses as he goes along. Even at this pace, he can obtain a degree in five years and one summer.

The cooperative program at present is limited to students of metallurgical, mechanical or food engineering, but it probably will soon embrace those who intend to be chemical engineers, too. At least 50 companies, in addition to those



already in on the arrangement, are interested in joining up. The trouble is—an irony to anyone who went to college in the depression years—that there are far fewer students in need of spending money than there are sources of it.

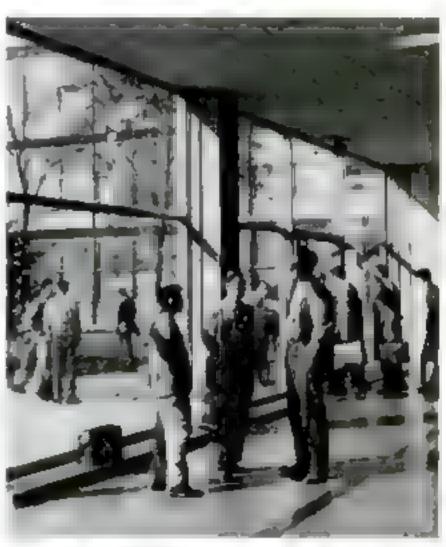
400 Concerns Compete for Graduates

Graduates of the big Illinois engineering school also find themselves in green pastures. This past June, 400 industrial concerns competed for their services, at starting salaries averaging \$350 a month. Interviews had to be arranged like doctor's appointments, and most graduates found what they wanted by the end of the seventh interview. What they wanted, incidentally, was primarily a job that interested them; salary rated fifth among the factors that helped them make up their minds.

Mechanical engineers are still in greatest demand, though the electronics, chemical and metallurgical industries are taking a constantly rising number of specialists in those fields.

As you might expect in a busy tech-

THE OVER-ALL PICTURE of Illinois Institute of Technology's setting in Chicago's South Side is seen here. Darker portion indicates the full extent of the forthcoming campus.



SETWEEN CLASSES, some future engineers have a burried exchange of ideas in the sunlit lobby of the hig technical school's new Metallurgical and Chemical Engineering Building.



TAKING TIME FOR HORSEPLAY in the course of this year's Junior Week festivities, a group

of Illinois Tech undergraduates engages in a coaster-derby obstacle race.

nical school, especially one that is expanding its walls as it pounds home logarithms and the laws of physics, sports have been neglected. Illinois Tech has no football team. Basketball is played in a temporary structure left over from World War II.

Temis courts are being built on the campus this summer, but the baseball team still plays scheduled games in a public park, the swimming team holds meets in a boys' club pool a mile away, the rifle team shoots in a Naval Armory, and the track team runs against long-legged outsiders on a field belonging to the Chicago Board of Education.

Exams Bar Baseball Practice

"I suppose," says Bernard Weissman, a graduate lawyer and former member of the F.B.I., who is director of athletics, "that we're about the only school in the country where a kid says he can't make baseball practice because he's got an exam tomorrow.

"We can't make overnight trips because the kids can't afford to miss a lab. My track captain couldn't run in a crucial meet at Beloit this spring because he was being taken into an honor fraternity that afternoon.

"But if anybody ever invents a sport

that can be played with slide rules, we'll put a team on the floor that will beat all comers."

Illmos Tech's president might easily be mistaken for a student. At 42, Dr. John T. Rettaliata is the youngest top official in any of the country's leading scientific schools. Trained at Johns Hopkins, tall, slim Dr. Rettaliata was a brilliant pioneer in the development of gas turbines

On leave from an important research job for Allis-Chalmers in 1943, he was flown across the Atlantic in a commercial amphibian with its curtains tightly drawn, to investigate British progress in jet engines for the Bureau of Aeronautics. His survey, satisfactorily completed despite intermittent interruptions from the Luftwaffe, resulted in a report that was most useful in the improvement of our own early jet planes.

On May 8, 1945, before many Germans even knew the war was over, Dr. Rettaliata was flown into Germany to learn the secrets of the Germans' highly ingenious new hydrogen-peroxide submarine. The Germans had exploded a bomb in their full-scale cutaway of the submarine before the Allied scientists arrived. Dr. Rettaliata had little trouble, however, in figuring out how it had worked. His

report, complete with detailed drawings and photographs, was a real war prize

for the Bureau of Ships.

He worked for a time, too, as a consultant to Allis-Chalmers on the development of a nuclear-energy engine for submarines. And, for several months prior to his selection from a field of 75 candidates to become the second president of Illinois Tech in 1952, he was engaged in a high-priority project for the Air Force that is still secret.

Perhaps the most important and distinctive part of Illinois Tech is its Armour Research Foundation. Since 1936, when it began with three scientists and \$40,000 worth of work to do, A.R.F. has conducted more than 7,500 research projects for 2,500 companies and the U.S. armed services. It undertakes to work out some of the trickiest civilian and military technical problems, strictly on a nonprofit basis.

Foundation Employs 1,100 Researchers

Today there are more than 1,100 scientists, engineers and nontechnical employees on the A.R.F. staff, and the Foundation is the second largest independent research center in the U.S. It is tackling nearly \$10,000,000 worth of research a year.

When International Harvester, for instance, wants to find a better repellent for rats, it engages this foundation. The A.R.F. has also helped a musical-instrument maker take the shrillness out of electric organs. It has developed a radiation detector for the Signal Corps, assisted a steel company in finding out how to make colored galvanized steel sheet, helped the Elgin people build an elec-

Foundation experts are busy overseas, too. They are helping Costa Rica step up and improve the production of abaca fiber, assisting Pakistan to establish a steel industry, helping India find a good way to make newsprint out of bamboo.

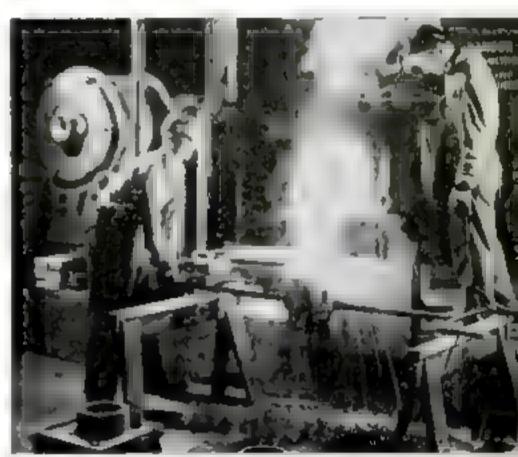
tronic watch.

Of the 19,000 alumni of Illinois Tech and its parent schools—Armour Institute of Technology and Lewis Institute—8,500

> [Continued on page 246] SEPTEMBER 1953 [59]



COLLEGE PRESIDENT AND FAMILY: Dr. and Mrs. John T. Rettahata with Stephen (left), Patricia and Brian. Mrs. Rettahata was a pathologist before she was married.



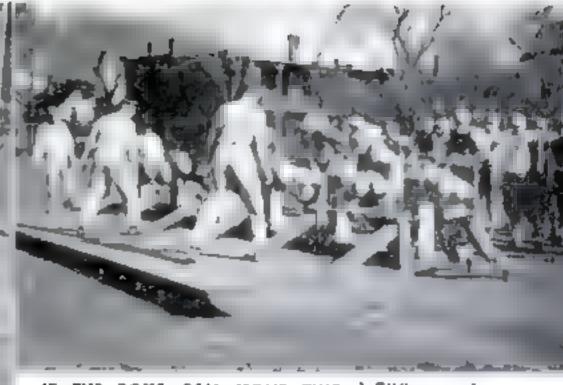
POURING STEEL AT 2,900 DEGREES habrenheit in Illinois Tech's famous Armour Besearch Foundation, which in 1952 did 88,106,000 worth of research.

a woman engineer, Lois G. McDowell, teachers thermodynamics at Himois Teeli. She is glad that other women, at her school and claewhere, are studying to become engineers.





LEARNING THE ROPES, when they are laid out like this, is tougher than open-field running, Gophers say. Fancy footwork is acquired after many an embarrassing stumble.



if the BOYS CAN MOVE this 1,700-pound wooden sled with two hefts, jeering coaches aboutd, no opposing human line is likely to stop them. See players charge it at a time.

Gophers Train with Gadgets



Bench Warms Benchwarmers

FOOTBALL players on the sidelines don't warm this bench: the bench warms them. The sandwichlike slab is radiant-heated. The top half is of Heaterete—a material of high thermal conductivity—with electrical-resistance wire embedded in it. Lower half is of concrete for insulation. The bench was devised by Lee-Don, Inc., Pittsburgh.

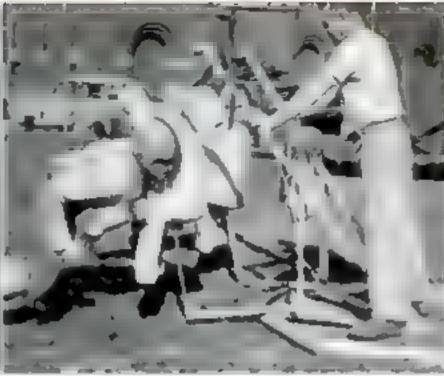
Two-Faced Stadium

INSTEAD of building two separate stadiums at \$60,000 each, Grand Junetion, Colo., built one grandstand to serve two playing fields at half the cost. Placed between a griding and a diamond, it seats 2.500 football fans on one side and 1,200 baseball fans on the other.

Raising one stand higher than the other left plenty of space beneath for dressing rooms and concession booths, and the cantilevered upper portion of the football stand shades the bleachers in summer. One control and press box atop the upper deck serves both fields. Smith, Hegner & Moore of Denver were the architects.

►►► A new football helmet, built around a shell molded of plastic and rubber, is said to give more protection to a conked noggin. Hard enough to take a heavy impact, resilient enough to absorb shock, it gives safety to the wearer without being a potential lethal weapon against an opposing player. The Wilson Athletic Goods Co., working with Goodyear, developed the helmet.





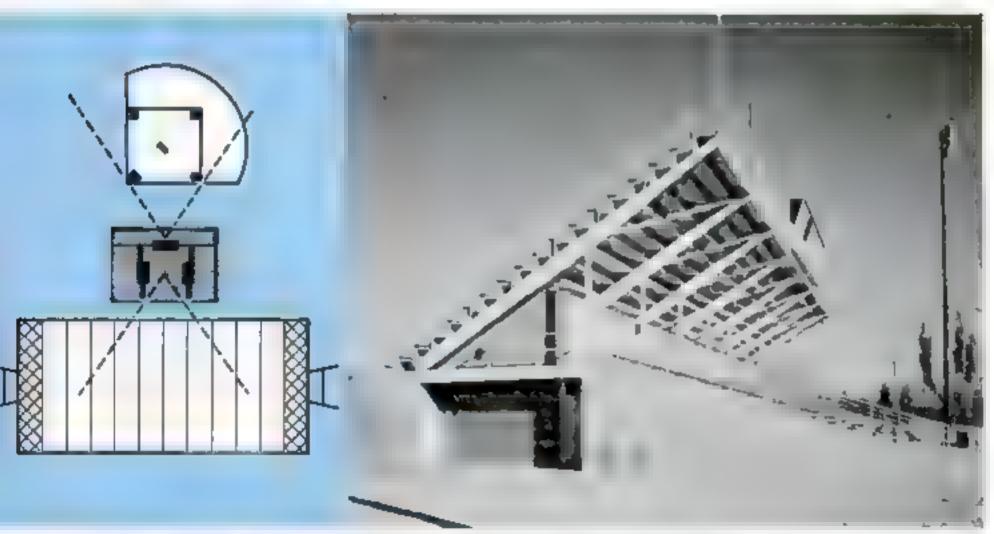
A SUMP ON THE BACK is assured for any hightailing Gopher who forgets to charge low out of this seven-man east-room stall. It has a roof of crisscrossed piping, 3½ feet high.

stocking, tackting and straight-arming are taught with the padded-steel Crowther charger, which came from Penn State. A coach goes along for the ride to give individual help.

The old-fashioned tackling dummy rarely gets a workout these days at the University of Minnesota. Wes Fesler, head football coach, has found that his Cophers can learn a lot more from tangling with gadgets of wood, rope, steel and cast from Four of the

busiest training devices are shown on this page in photos from the Mumeapolis Star. The charging stall (left above), originated at Nebraska, is raised on blocks. As training advances, the blocks are removed to make the players hit even lower.

Doubles for Football and Baseball Fans



for 3,700 still leave 2,500 square feet for dressing rooms and vendors' stalls. The whole job took only 90 days, cost \$16 a seat.

UPPER STAND JUTS OUT into space carried on cantilevered steel beams. Lower seats are concrete slabs cast on fill. Upper ones were precast as units, then bolted to the steel.

I'd Like to see them make...

Everyone has his own get Idoa of some godget he would like to see in general use. What is YOURS? Papular Science Manthly will pay \$5.00 for each one published. Use government postcords only. Contributions cannot be acknowledged or returned.



OVEN SHELVES that would pop forward and up to a no-stoop height when the stove door is opened, like a typewriter shelf in a desk.—
M. M. Strobel, Union City, N. J.



INTERLOCKING CANS for canned foods. If tops were humped and bottoms hollowed, it would reduce stacking time, prevent toppling.— William P. Bohnet, Blackwood, N. J.



AN ADJUSTABLE READLIGHT mounted over the guiding notch on electric handsaws so you could follow a hard-to-see guide line.—John D. Bell, Provincetown, Mass.



LIGHT SULES under car fenders, behind sliding or hinged doors, so you could just switch on a light when you have to change a flat at night.—Frank Froschauer, Bloomfield, N. J.



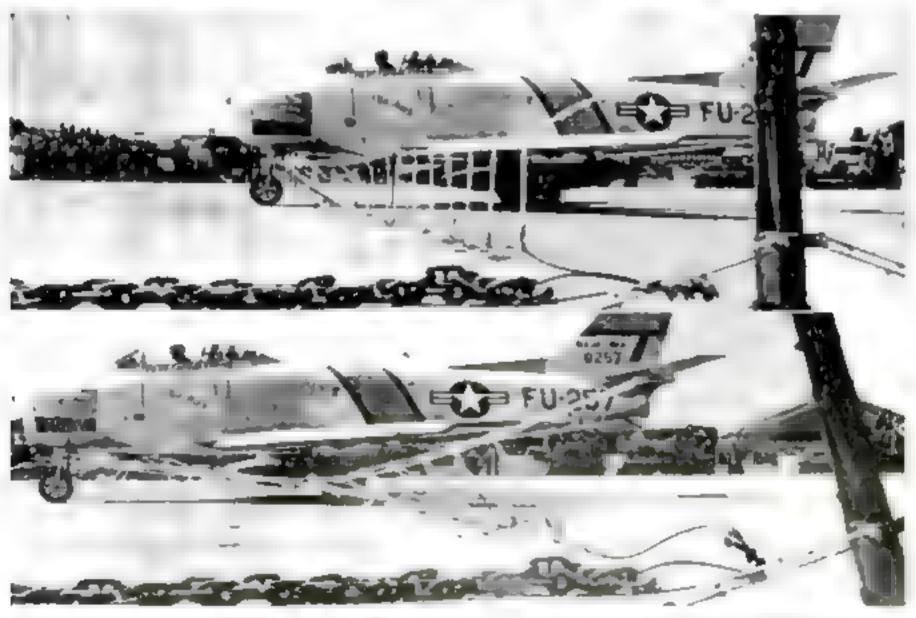
AN ICE-CUSE MAKER that would plug into any electric outlet for use in motels or for making extra ice for parties at home.—Mrs. B. C. Dickinson, Buena Vista, Ga.



Steam Drill Eats Its Way Through Granite at Record Speed

UNDER 400 pounds of steam pressure, this percussion drill puts the bite on granite at a rate of 45 feet an hour—almost three tunes faster than the best previous method. Beating on solid-head bits, the drill makes up to

3,000 four-inch strokes a minute. Exhaust steam from the hammer piston carries away grandings. Ross Bassinger of San Antonio designed the drill, shown operating on steam from a Vapor-Clarkson generator.

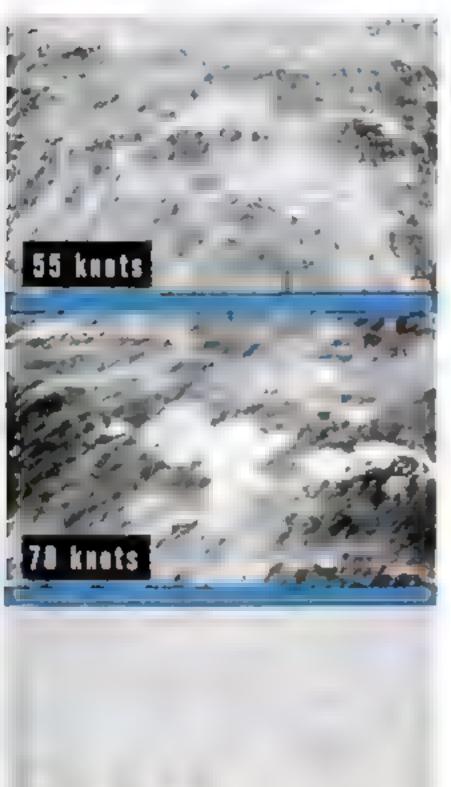


Dry-Land Arresting Gear Grounds Jets Safely on Short Runways

F-86 Sabrejets now make safe forced landings in the limited length of emergency airstrips, using a dry-land counterpart of a carrier deck's arresting gear. Ten pilots and their planes have been saved to date by the

apparatus, demonstrated above in Japan. A barrier like a tennis net, hit by a jet's nose gear (upper view), raises an arresting cable that snares the main landing gear (lower view).

How the Little Hurricane Knocked Out the Big Hurricane



TELITALE SIGN of hurricane's wind speed, to serial observers, is aspect of ocean's surface. Here's how sea looks when whipped by winds of 55 knots (63 m.p.h.), 70 knots (80 m.p.h.) and 120 knots (138 m.p.h.). Wind speed above 125 m.p.h. turns it almost white.



By Ernst Behrendt

LATE in August 1951, or early in September—no one knows the exact dates—two great hurricanes were born near the Cape Verde islands off the west coast of Africa. They were both vicious killers But one of them was destined to save thousands of lives. This is the story of how it happened, in the first collision of hurricanes ever recorded.

In due time the two hurricanes had received names, as do all that come to the notice of the U. S. Weather Bureau. The first one was named Easy, the other Fox. Both Easy and Fox were to play an unforgettable role in the history of Bermuda, 4 000 miles across the Atlantic from where they were brewed.

Brewing seems the right word to de-

128 knets



whirlwinds' providential collision saved a doomed island.

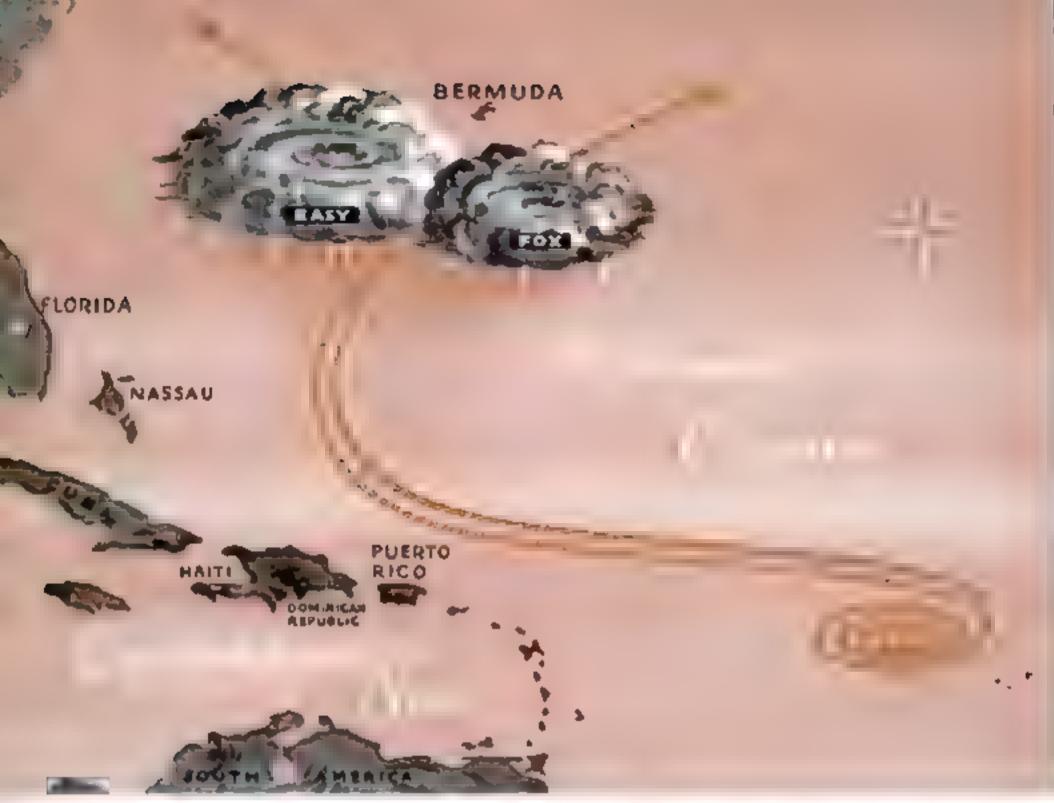
scribe the birth of a hurricane. The vast storm summers for a long time in a heated cauldron before it is ready. Day after day the tropical sun beats down on the calm glassy ocean, till the water is warm, and the air above it hot and humid. Then, at one point a column of heated air rises. The rotating force of the earth twists the column into a spiral that slowly begins to spin. It may collapse, or be toppled over by the wind, or become stunted and end its life as a waterspout. Or it may grow into a hurricane.

Updraft Spells Danger

When Easy began stirring, one day, it cannot have looked too dangerous. At most, one would have seen a column of clouds twisting upward to a height of 25,000 or 30,000 feet. Easy was only a

few miles across and it lacked about everything a hurricane is supposed to have: strong winds, torrential rains, huge waves. But it did have the one thing that makes a hurricane dangerous: a concentrated, tremendously powerful updraft. Possibly this column merged with two or three others like it, to form what was to become the strong central column—the heart, or "eye"—of the hurricane. At any rate, Easy did grow, as \$7,000 frightened residents and vacationers on Bermuda were to testify eight or 10 days later.

Inside the spiraling central column, humid air was rushing up like smoke in a chimney. The higher the column rose, the stronger the updraft became, and the stronger became the whistling winds feeding warm, humid air into it. Heavy



Drawing shows collision of hig hurricane, Eusy, and little one, Fox, that overtook it.

squalls churned the sea. Choppy waves grew into large breakers—and these into crashing 100-foot-high walls of water.

Having risen miles above the sea, the column was stopped-pressed down by a heavy layer of cold air. The top of the spiral was squashed and flattened. It mushroomed out and assumed a characteristic funnel shape. Viewed from above, Easy must have looked somewhat like a spinning phonograph record, with a hole-the eve-in its center. Where warm and cold air met, moisture condensed and rain fell. This was the first of the unending series of downpours that were to fringe Easy from the Cape Verde islands all the way to Bermuda. As ram was squeezed out of the air, the hurricane spun faster.

It was well on its way now-still growing, still sucking up the warm, moist air on which it lived and grew. It was rolling along at a fairly moderate speed, probably no more than 10 or 12 miles an hour; hurricanes never travel very fast. But the winds around its center were terrific. Even at this early stage they probably reached 150 miles an hour.

By the time Easy had moved along for about 1,000 miles, new columns of warm air began spiraling up in the Cape Verde doldrums. The cauldron was brewing a new hurricane. This one was to be named Fox.

Easy Was a Killer

Easy was first spotted far out in the Atlantic, about 2,500 miles off Florida. The storm was then about 500 miles wide. Weathermen immediately recognized Easy for what it was: a hurricane of the worst type, a killer, one of those truly disastrous storms which occur maybe once every three or four years.

At this point some people suggested, "Let's explode an atom bomb in front of

Easy. Surely the power of an atomic explosion will make the hurricane change its course." But an atomic explosion would do no such thing. A hurricane packs the power of hundreds of atom bombs.

Flying into the Storm

It was vitally important to gather all available information about Easy and dispatch warnings. The accepted procedure for the first job is to send a plane staffed with experienced meteorologists into the very center of the hurricane. During their flight they send radio messages on what they encounter: wind velocity, rain, barometric pressure

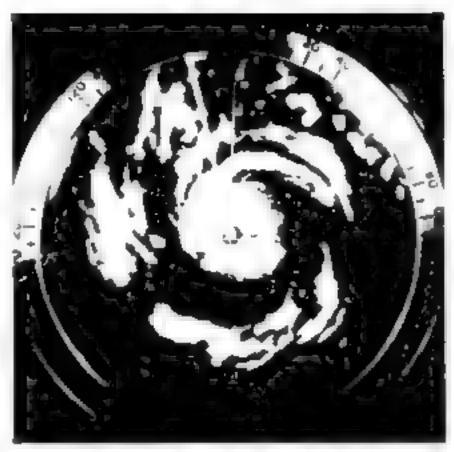
A four-engine plane was sent out to investigate Easy. The plane bored into the hurricane from below. From an altitude of less than 1,000 feet, trained observers watched the pattern of the waves, reading from it the speed and di-

rection of the wind.

As the plane approached the fringe of the storm, the observers first saw whitecaps, which meant that winds were blowing at 30 to 35 miles per hour. A little later green spots appeared on the whitecaps: 40 miles. The green spots grew larger: 60 to 65 miles. White streaks across the waves: 80 miles—90 miles—100 miles. The ocean turned almost white: 125 miles.

Heavy rains were pelting the plane. At noon the sky turned black. 130 miles. Dead ahead, "prongs" appeared: spiral bands of wind converging on a center, an indication that the eye was not too far ahead. 140 miles. The plane was taking a fearful beating. Some of the men were sick. 150 miles. Vicious vertical winds were jerking the plane up, pushing it down almost into the spray of the 100-foot breakers. As Easy clawed at the plane, the radar operator went on reporting every five minutes on wind direction and velocity

When the operator said, "160 miles," there was one thought only in every man's mind: "Will the wings hold?" Then the operator called out the unbelievable figure of 175 miles an hour.



EYE OF A HURRICANE looks like this in radarscope of a plane flying high overhead. Picture on screen clearly shows the typical spiral formation of clouds.

They were only about 15 miles from the "eye," the calm center of the storm, when the pilot had to call it quits. The plane turned back. That decision probably saved the men's lives. They would never have gotten through the almost solid wall of wind and water surrounding the eye. (On October 27, 1952, a B-29 weather plane with a crew of 15 disappeared and probably disintegrated near the eye of a typhoon lashing the Philippines.)

Floridians Alarmed

People along the coast of Florida were alarmed, and their alarm was justified: the striking power of 175-mile-an-hour wind is almost beyond imagining. (The winds of the great Galveston hurricane that killed 6,000 people in 1900 probably did not exceed 90 miles an hour.)

The Florida watchers also wormed about Fox, which was now reported to be tagging along 1.000 miles behind Easy.

Suddenly Easy shifted its course. At a point north of Puerto Rico, it veered north. New storm warnings went out. Weathermen replotted Easy's course. There was no doubt: the killer hurricane was headed north in a huge are that would take it straight through Bermuda.

Twelve hours later, Fox, gaining speed

all the time, reached the spot at which Easy had turned north, and did exactly the same thing. Like a bloodhound following a track, the smaller hurricane clong persistently to the path of the big one.

People in Bermuda were paying hardly any attention to Fox. They were concerned only with Easy. Ships in the horricane's path fled out of range. The U. S. Air Force pulled its planes out of Bermuda. In Hamilton, the capital, as elsewhere on the islands people were boarding up homes and hotels and shops, though doubtful of how much protection this would give against winds now clocked at 200 miles an hour.

Disaster One Day Off

On September 8, the barometer started to fall rapidly, the killer hurricane was less than 24 hours away. Disaster seemed certain. Then a new bulletin was flashed, "Baby hurricane headed for collision course,"

The "baby hurricane" was, of course, Fox-a monster by any standard except

the one set by Easy. The two hurricanes now were only hours apart. On Bermuda, tension increased "Collision course"—what did that mean? Could hurricanes actually collide? If so, what would happen? Would the winds of one reinforce those of the other? Would Fox add its 120 miles an hour to Easy's awful 200?

The meteorologists came up with a surprising theory. They had no record of an actual collision between two hurricanes, but they reasoned that hurricanes are like tops spinning in the same direction. When two tops bump into one another, they move off in opposite directions.

By early morning, September 9, Easy's winds were striking ferociously at Bermuda. At five a m., the winds had reached speeds of 45 to 50 miles per hour. This was not yet the real hurricane; "hurricane force" begins at 75 miles per hom. But the time was not far off

Winds of true hurricane force were only 10 miles away from Bermuda-with

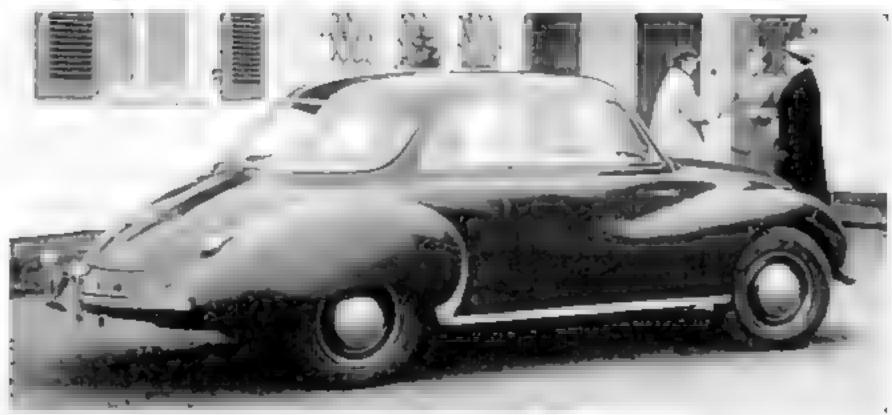
[Continued on page 280]



IN SEPTEMBER.

hurricanes. A tornado (PSM, April '53, p. 187) wreaks tremendous damage in a pinpoint area. One single hurricane may churn up half the North Atlantic Ocean.

Remarkable progress has been made by the Weather Bureau's warning system. Follow those warnings, if you are in a small craft when storm warnings are hoisted, get into harbor. If you are ashore, get indoors and stay away from windows. Keep the radio on and follow its advice. Drive away from the area of a hurricane, if you have advance warning. Do not mistake the cloudless, calm center of a tropical hurricane for its end. In one Florida tragedy, many persons lost their lives because they went outdoors too soon and were caught by the hurricane's second half.



Four-passenger D.K.W. develops 34 horsepower at 4,200 r.p.m., will do 70 miles an hour.

Three-Cylinder Car as Smooth as a Six

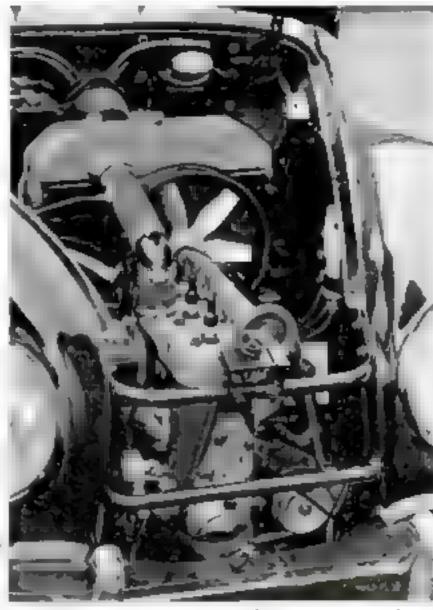
A THREE-CYLINDER automobile that runs as smoothly as a six is being made in Germany. It's smooth because the engine is a two-cycle—with a power impulse on every second strike

Known as the D.K.W. "Special Class" model, the car produces one horsepower for each 1% cubic inches of piston displacement. For comparison, the newest of Chevrolet's six-cylinder engines produces one horsepower for each two inches of displacement.

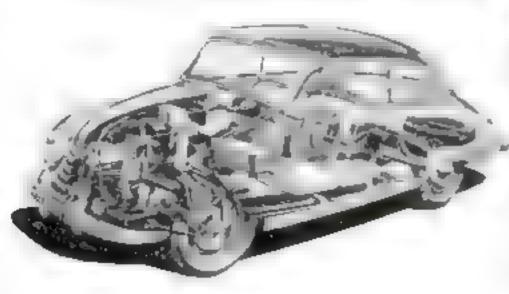
Like a marine outboard, the three-cylinder engine has exhaust and intake ports in the cylinder walls. The piston uncovers them at the bottom of the power stroke. The lubricating oil is mixed with the fuel at a ratio of 1.20. The fuel is piped to the crankcase and forced into the cylinders by the pressure build-up in the crankcase as the pistons come down.

Each of the three spark plugs has its own coil. From a primary circuit, distributor current is passed through the coil, changed to second-current voltage and fed to the plags

The engine delivers almost 28 miles to the U.S. gallon of gas.



RADIATOR AND FAN, run by extension shaft on top of block, are at rear of engine. Cutaway at left shows installation of front-wheel days unit and absence of floor tunnel.



Fastest Flier Gets Fitted for



1 FIRST STEP in making de luxe safety belmet is shaping a heat-saftened way shell to contours of flux's head.

2 PLASTER poured into wax mold forms model of his head. Hatter's task is somewhat like that of a sculptor.

3 is ready to remove from mold, to serve as flier's standin for shaping belief finer.



5 FOAM RUBBER, poured onto the cellulose acctate in the bowl, makes a cushioning interior layer for the liner.



6 with plaster HEAD MOLD set in goody rubber, as above, bowl of liner material is ready for curing in oven.



7 SUCED IN HALF after curing, and with suede-leather covering inside, liner will fit into Fiberglas-and-resin shell.

They Say Now.....

PROF. BERNARD COHEN OF HAR-VARD: "To those who make the most intelligent scientific guesses we give Nobel prizes."

DR. ROBERT GESELL, UNIVERSITY OF MICHIGAN MEDICAL SCHOOL: "The speed and streamlining of the mackerel, the jet propulsion and smoke screen of the squid, the echo locator of the bat's radar system, the physical bulldozer

power of the rhinoceros, all of which were built into the substance of these creatures by hundreds of millions of years of evolution, have within recent years become available to man as artificially acquired equipment for living or fighting."

EDWARD R. MURROW, CBS-TV RE-PORTER: "My father always thought there was something doubtful about making a living merely by talking."



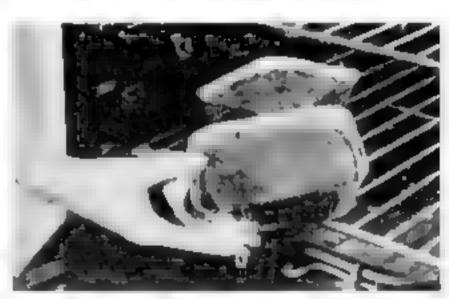
8 OXYGEN-MASK TAB is rivbetted to lined helmet tough as steel, soft as silk, excluding all sound but radio.

9 SILL BRIDGEMAN, who's flown 1,238 m.p.h. in Douglas Skyrocket, done a finished Toptex crash helmet. In an accident, it could absorb a terrific blow harmlessly. Custom-made by Protection, Inc., Inglewood, Calif., each helmet costs 8215.



Shoes Put Bounce in Your Step

STEP out in these shoes, and you get a smoother walk and a helpful push ahead Soled with wavy gum rubber, sports and walking shoes spring up and ahead when stepped on. There are special models for wounded yets.



Cook—and Throw Away the Pot

ALUMINUM-FOIL baking utensils (above) save a lot of pot scrubbing. You can bake food, cover it and freeze it, and later reheat it—all in one pan. Said to be cheap enough to throw away after use. Ekco Foilware can, however, be cleaned over and over again.



By Gardner Soule

Build the shelves to fit the woman.

Build the shelves to fit the supplies.

Build the kitchen to fit the family.

Starting with these three principles,

Cornell University has re-engineered the

most-used room in the house.

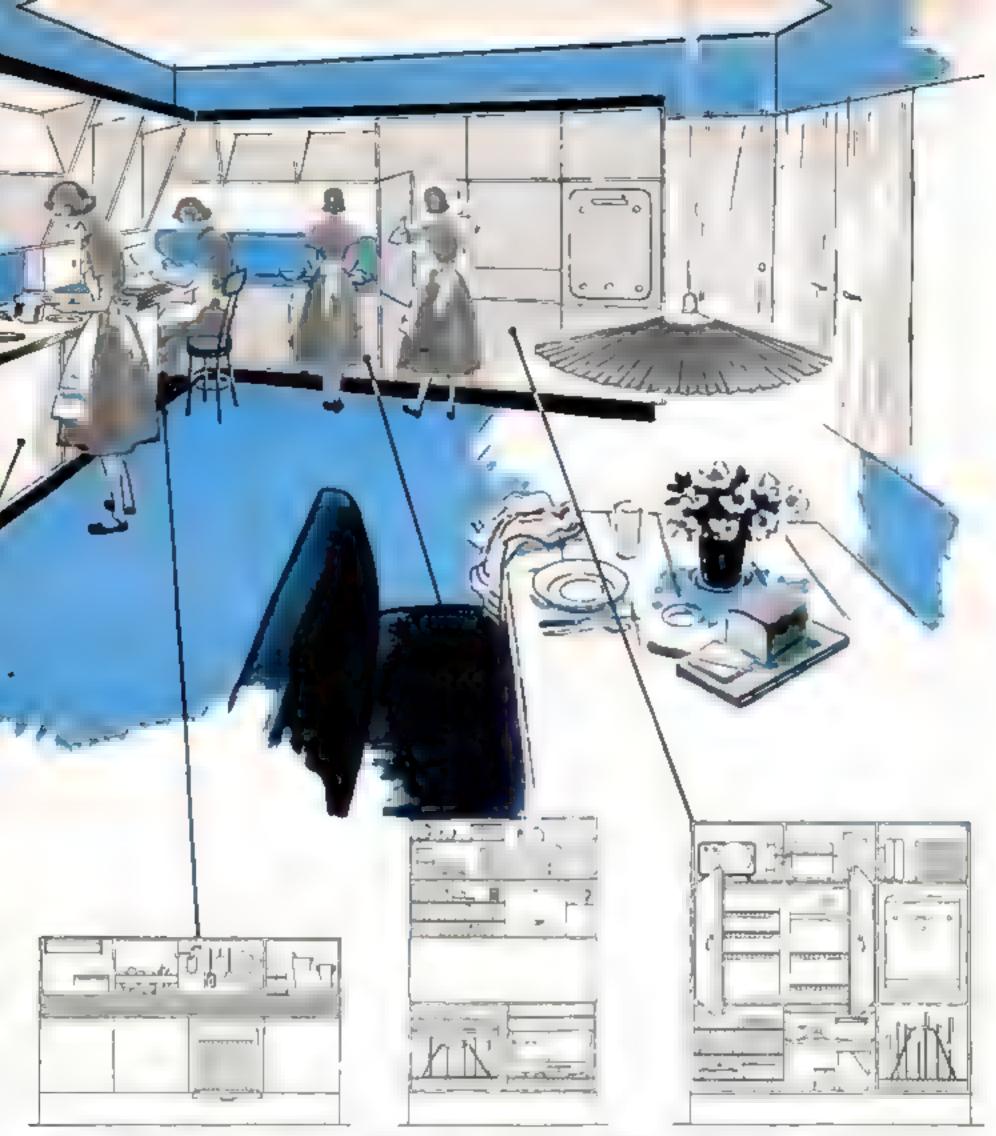
SERVE CENTER stores china, glasses, silver and linen where they are close to the dining area, located at right above.

RANGE CENTER has four electric burners and their controls set into a counter top. Wiring for the range is built into the cabinet.

The result is a kitchen equipped with:

- Cabinet counter tops that are adjustable—even after installation—to fit a woman of any height, or arm length.
- Shelves or other provision for storing all food and equipment.

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SINK CENTER has storage bins behind sink for fruits, vegetables, soaps, detergents. There's a footrest and chair so the housewife can sit at the sink. Dishwasher may be added.

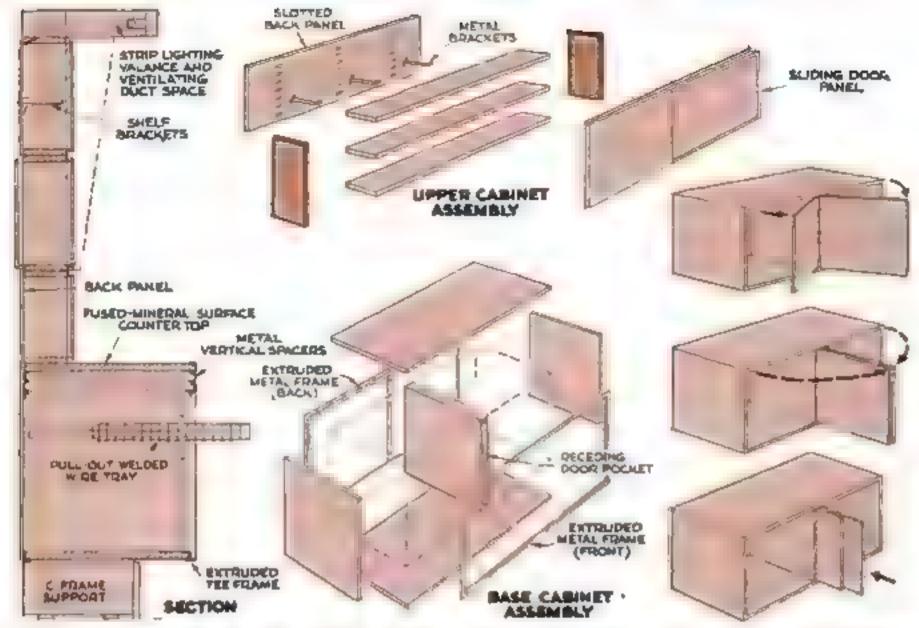
MIX CENTER contains built-in hims for flour and sugar and a flour sifter. There's an electric outlet for the mixer. Cake pans are racked in cabinet below the counter.

OVEN AND RESTIGERATOR are both waist-high at center for greater accessibility. Refrigerator contains freeze chest and pull-out drawers that chminate reaching in.

 Separate work center tailored to fit your family now, and ready to be taken down any time by a handy man for rearrangement to meet new family needs.

All these things, and many other fresh ideas, were included in the kitchen be-

cause so many experts worked on it. The experts came from the campus, from manufacturers, from federal, state and private agencies. Their work was coordinated by Glenn H. Beyer, professor of Housing and Design, and director of



MICHANICAL DETAILS of work center: Lighting is shown at top left, pull-out tray at bottom. Top center: Shelves, brackets, parts of upper cabinet. Bottom center: Exploded

hase cabinet. Buse cabinet doors open, slide out of way as shown in three sketches at right above. Arrangement eliminates tripping over doors, keeps contents of cabinets in sight.

Housing Research Center at Cornell. "Build the cabinets to fit the woman," was the first Cornell principle.

How do you tell? There are no tables listing the right counter heights for women of different heights. There can't be. If there were, the varying arm lengths of women would throw off the tables.

Counter Tops to Be Raised or Lowered

Cornell solved the problem with adjustable counter tops. Any woman can learn, from a few days' experience, where her most comfortable working surface is, then have her husband put the counter top there—or do it herself. The counter top is held up by vertical spacers inserted into parallel rows of holes in the inner frame of the cabinet. They're like the supports at both ends of adjustable bookshelves.

To learn more about the woman, and so to fit her better, Cornell's home-economics department borrowed a method right out of the football team's bag of tricks.

Like most colleges, Cornell takes mov-

ies of its games and studies slow-motion pictures of them. The home-economics department photographed, in very slow motion, many women at work in many kitchens. The Cornell kitchen was planned according to results of these films.

Almost no women, they showed, ever used the oven and range top for the same kitchen job. So Cornell separated oven from range. It put the oven next to the refrigerator, and built both oven and refrigerator into one work center at a waist-high level.

The Cornell kitchen thus is not a collection of separate stove, icebox, sink, and cabinets, like an ordinary kitchen. Instead, it consists of five work centers—the oven-and-refrigerator, mix, sink, range, and serve centers.

The centers are planned around the ideas of Mrs. Mary Koll Heiner, among others. Mrs. Heiner is associate professor in Cornell's home-management department, and a woman who for 35 years has worked to simplify the labor of the homemaker.

Mrs. Heiner and her associates, some



All DRAWERS, TRAYS in base cabinets pull out. There is no reaching to permanent back shelves. Range burners are in a staggered line so food being cooked is easy to watch.

REFUSE CONTAINERS are at sink. There are three: for paper, waste food, cans. Door holding them clicks back into waste corner space under counter above.

years back, came up with a new principle to help the cabinets fit the woman. It is called the principle of storage at the point of first use. It means everything in the kitchen is kept where the homemaker will use it first.

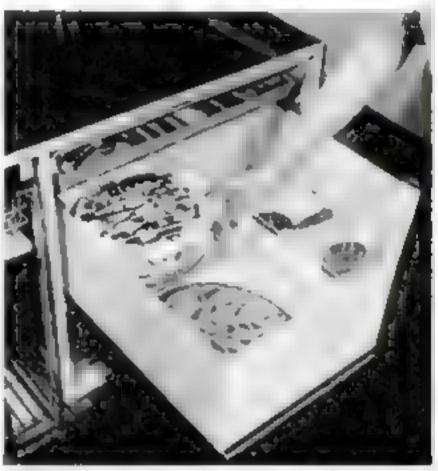
This principle of storage at point of first use saves literally miles of walking.

Researchers Were Sent Out

"Build the shelves to fit the supplies," was the second Cornell precept.

Professor Bever—with the assistance of housing-research staff members from the State University of New York and the U. S. Department of Agriculture—sent droves of researchers into homes from Maine to West Virginia to find out what was kept in kitchens. They found that, regardless of family size, most housewives keep about the same amount of food and supplies on hand, and have about the same equipment. Only exception to the rule are penshables like bread.

So the Cornell kitchen has a place for everything U.S. families keep in kitch-



PULL-OUT bread- and cakebox is feature of mix center. Transparent plastic covers keep bread, cake, pie from drying out. Kitchen has pull-out breadboards and lap boards,

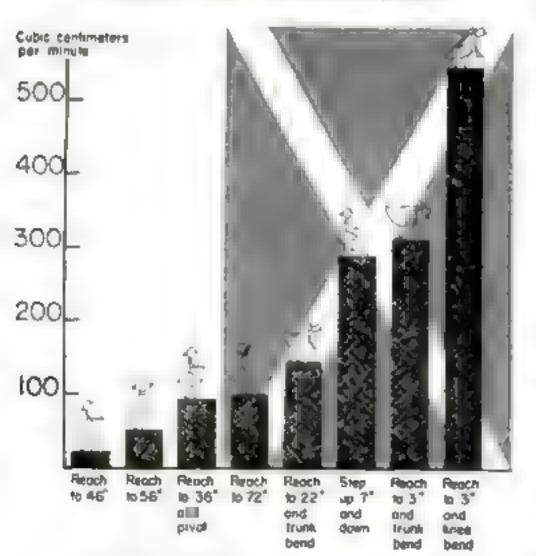
ens. Most supplies are stored between 30 and 60 inches off the floor, making reaching for them easier.

"Build the kitchen to fit the family," was Cornell's third and last rule.

Architect Frank Weise of Philadelphia



IN PLANNING KITCHEN, Cornell used "memomotion" (very slow) movies to show housewife's actions. Wall and floor lines showed her position. Clock timed everything.



THE MORE OXYGEN a woman consumes while working, the harder she is exerting herself. Cornell kitchen channates most movements shown in chart, except three easy ones at left.

took the ideas produced by Professor Beyer and Mrs. Heiner, and all the other experts, and put them into work centers designed as you see them in the photographs and drawings.

Range, mix, and serve centers are each four feet long; the refrigerator-oven center, six feet; the sink center, eight feet. Grouped as a U, they can all go into eight by 12 feet. That's all the space you need for a complete Cornell kitchen.

Or the work centers can form an L, or go along a long wall. This leaves more room for your child to play, for a breakfast nook or an easy chair.

The work centers are free standing—do not have to fasten to the wall. They can run right across the middle of the floor, and divide a big room into a kitchen and room for a laundry or other purpose.

Easy to Put Up

For the handy man's convenience, the Cornell kitchen will be made largely of standardized doors, counters, trays, and other parts, and it is planned for simple erection. This consists mainly of bolting cabinets to the back C frames supporting them, and attaching cabinets to floors with bolts that adjust for differences in floor level. "It is," says Beyer, "a one-man job—no more trouble than making something with an Erector set."

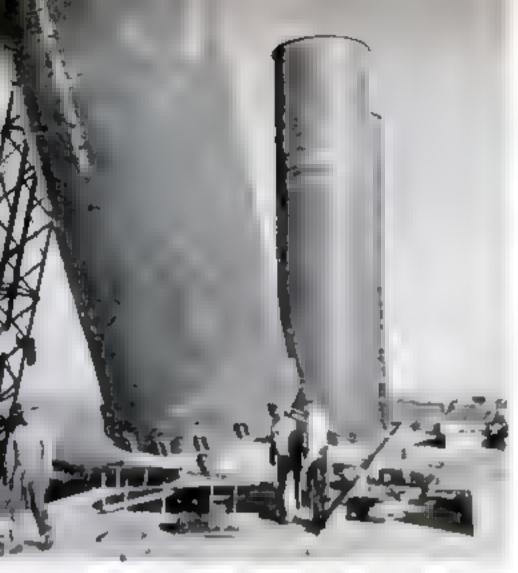
Almost any color, including natural wood, will be available when the kitchen is manufactured. Cornell hopes it will be on the market sometime in 1954. For more information now, write the Mailing Room, Roberts Hall, Cornell University, Ithaca. N. Y., send \$1, and ask for the booklet. The Cornell Kitchen

The kitchen, once in manufacture, will be a contradiction in terms:

 It will be mass-produced and therefore moderate in price.

 Though mass-produced, it will also be custom-built—because it can be arranged to suit any family's needs.

You will even be able to take down the Cornell kitchen and carry it along when you move. That is, if the people who buy your house will let you.



Mining Brimstone with Water

Hor water from these flue gas heaters will melt sulfur and hong it to the surface in a multinullion-dollar plant at Garden Island Bay, La, where one of the world's greatest acposits has been found



Tool Digs a Square Hole

Sou you holes are dug for square posts by the implement above exhibited at an invertors, show in London, England. It takes a 64-inch-square bite, and can be used to excavate larger areas, too

Can You Read Signs?

Here are 12 symbols used in sciences, arts and crafts. See how many you can identify correctly, by writing each one's number after the right definition in the list of 13 below...

Fair warning: The extra definition is false leave a blank space after it. To check your score, see upside-down answers at bottom of page.





P.S.

Last minute news & notes...

IN DFTROIT some folks are worried by leveling off and possible slight downcurve in average annual mileage put on cars. One explanation is more families now have two cars. a other. that roads are so jamed prople stay home more . . . Auto makers, blandly stating, "What horsepower race?" are still boosting engine power. One engine may be hopped up by an eye-popping 25 percent in '54 . . . Anroying bigs are reported to have held up release to public of Studebaker-Warner Gear mechanical power steering described in PSM last winter . . . Urevpected headache in some 12-volt auto ignition systems has turned up: crossfiring. It's caused by induced voltages between high-tension wires lying close together, and is being corrected on production cars by positioning wires more carefully.

NYLON-CORD PASSENGER TIRES have been brought out by U.S. Rubber and Firestone. Latter is tubeless. Nylon is said to increase strength up to 90 percent . . . Driver's licenses are now required in every state in the Union. South Dakota is latest to pass law . . . Meanwhile 10 more states require turn-signal devices on new care, making 14 so far.

| America's Need for Engineers Grows | | | |
|------------------------------------|------------------------|---|--|
| YEAR | ENGINEERS | WORKERS | |
| 1890 | Ŷ | | |
| 1953 | ***** | 24222 | |
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| į | | Based on White Empire no. Stevens Institute of Technology | |
| À | == 50 WORKERS Also are | WORKERS Also are page 1 to | |

ODOR-FREE OIL PAINTS, including glossy finishes, are announced by Du Pont. They use new mineral spirits that don't smell . . . Du Pont's rew photographic film base is said to be twice as strong and four times as stretcable as present types . . . A Vermont company sprays cactus fibers with U.S. Rubber's latex, stuffs them into cushions, while Florida scientists have found a way to get wax from Spanish moss. They say it gives a hard, glossy finish to woodwork.

ADMIRAL BYRD is planning a new South Pole expedition . . . Rubber-tire particles make up 40 percent of airborne city dirt, according to a Chrysler Airtemp survey. Other elements: coal soot, 30 percent; sand and grit, 20 percent; live bacteria, 10 percent . . . Trolley coaches are 3.5 cents per mile cheaper to run than motor coacnes, reports Ohio Brass Co. Chief saving: they can be left outdoors, yet last longer.

GOLFERS SHOULD STUDY PHYSICS to improve their games, says an Iowa U, professor--who shoots in the low 70s himself. Ballistics, rotational energy and friction play a big part in the game. One tip: hit low on the ball when putting, so that it slides first, then rolls.

JUNIOR'S MUMPS got you worried?
Doctors say 30 to 50 percent of
grownups have had disease without
knowing it. A skin test reveals
immunity . . . Fat children actually
eat less than skinny ones, a study
of patients at a Boston dental
clinic indicates. Possible explanations: their stout build, hereditary, conserves body heat better
than thin physiques: they may be
less active than lean children.

CUR ATOM SOMBS are kept in underground arsenals, the ALC reveals, in asking funds to build more-the existing ones are becoming crammed to capacity. Never mind asking where they are, that's "top secret"... A household water-softening chemical has been found the best thing to clean up with after an atomic blast. It removes radioactive debris from walls, furniture, skin.

The Editors

Lifting, they say, is done by men with weak minds and strong backs. Be smart! Learn how . . .



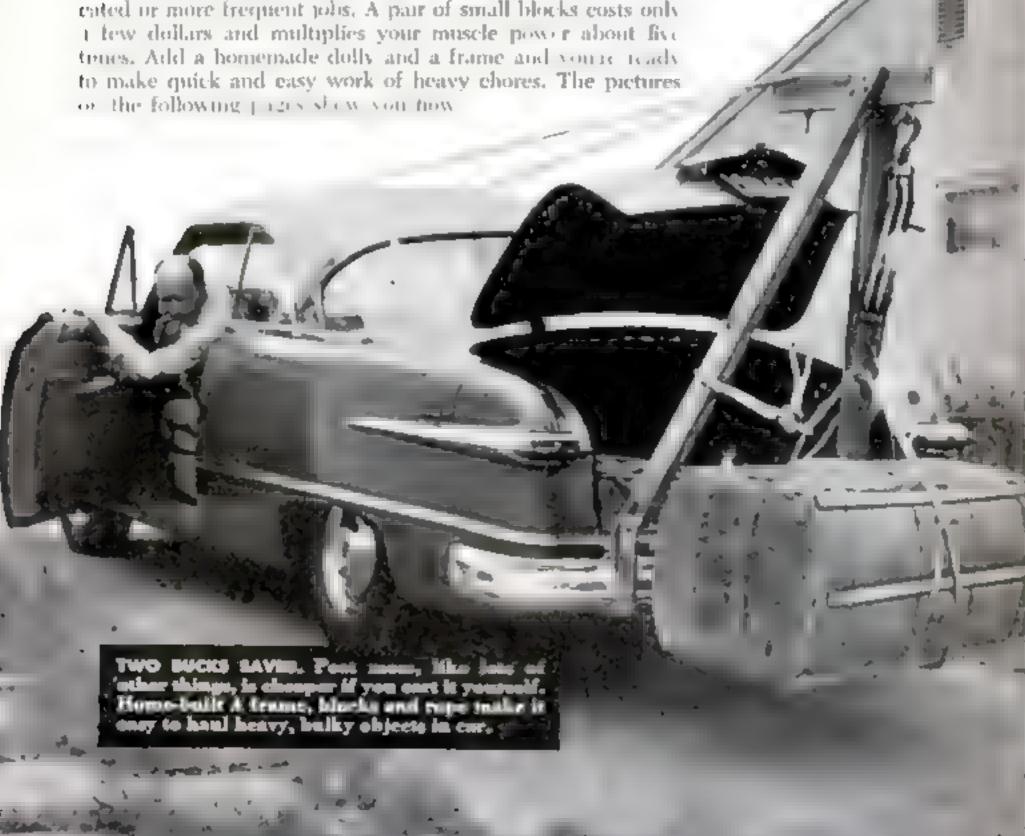
Riggers' Secrets Lighten the Heavy Jobs

LIFTING is for circus performers, not the home handy man. Sliding will almost always do the same job easier. If your wife wants the refrigerator shifted, use a short two-by-four to tilt it while you shp a small rug underneath. Then just push The same technique works fine for radiators and heavy furauture.

You can even slide things outdoors over cameting or apand down stairs. Just put down I ands to form tracks

Simple rigging equipment is the aiswer for more complicated or more frequent jobs. A pair of small blocks costs only I few dollars and multiplies your muscle power about five

By Herbert R. Pfister

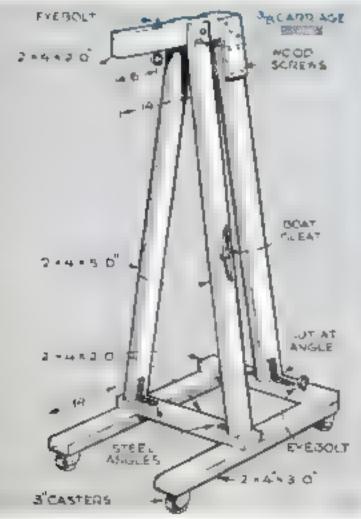




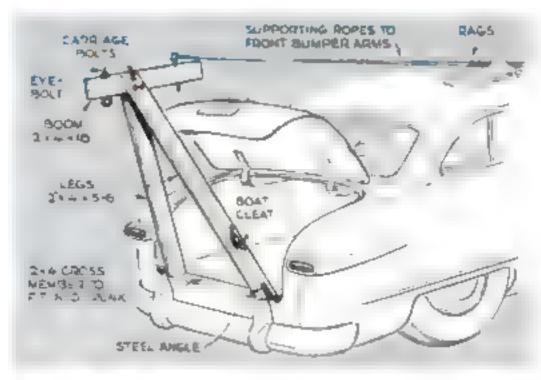
standaro slocks with two sheaves apiece cont less than \$5 for a pair, provide 5-to-1 mechanical advantage, Labels identify parts. RATCHET-ACTION HOIST simplifies rigging, since the pawl locks a load in mid-air. Loads of more than a ton can be handled safely with this one made by Lug-Atl Co., Wynnewood, Pa. Handle bends if overloaded.

MIGHTY MIDGET can lift 1,000 lb, with nylon cape, has triple sheaves for 7-to-1 gain. Western Control Corp., Wichita, Kan, makes the Handy Hoist.

These Are the Lifting Devices to Use



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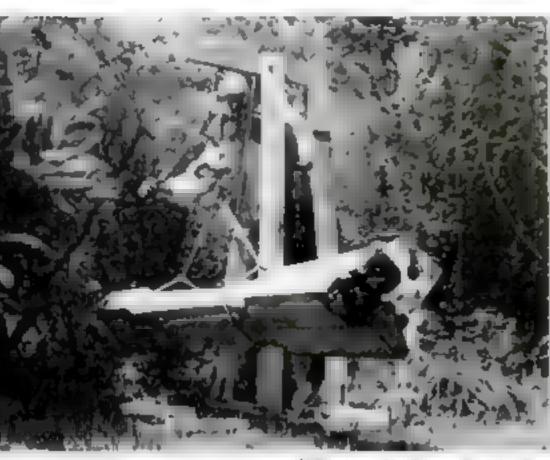
A FRAME will support your hoist wherever you want to use it. The two shown, built of two-by-fours, provide a way to move as well as lift the load. The one above, for long haule, is designed to fit in the drain well found behind the trunk of many cars. The other, sketched at left, makes shorter moves easy. Its detachable dolly can also be used alone for many moving jobs. Four angles hold frame on dolly.

These Are Some Jobs You Can Do with Them

IF Your attic has a trap-door access, block and tackle are practically essential. You then can hoist into the attic heavy trunks and unwanted machines and furniture that otherwise would take up valuable closet space. But rigging gear comes in handy around any kind of home, inside and outside, for a wide variety of jobs. Some ways to use it are suggested here.



tiffing's NOT THE ONLY JOB for block and tackle. Here car is pulled from muddy ditch with tackle attached to convenient tree on opposite side of road. Bumper arms take strain.



HEAVY COLUMNS are lifted, rolled out behind garage. Large casters or subber-tired wheels are necessary to roll dolly crane on soft earth.

HEAVY TRUNK is backbreaking job to drag into attic. Wrapped with long sling, it can be hoisted through trap door with little effort.

SETTING UP A NEW LATHE is a job for which you usually would need several husky neighbors. But the dolly crane lets you do the job alone. Rope sling is wrapped around heavy headstock (left below) with wood block to protect lead screw. In this case, single block gives high lift required; a double one would

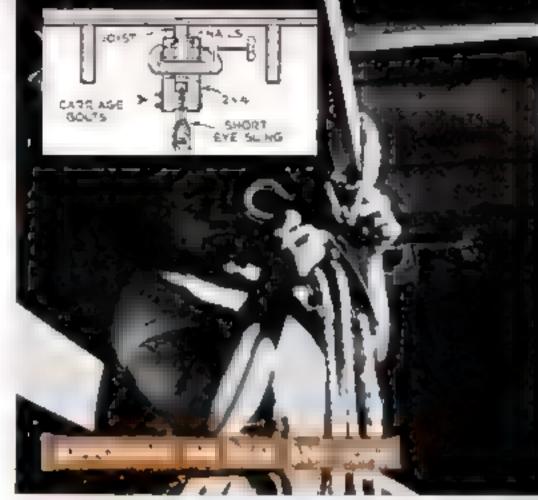
hang too low. However, double block is hooked between dolly eyebolt and short lifting line (center) to keep mechanical advantage. After lathe is raised, head end is set on the stand first (right). Then dolly is pushed close to swing in tail. (Please turn page for more photos about rigging.)



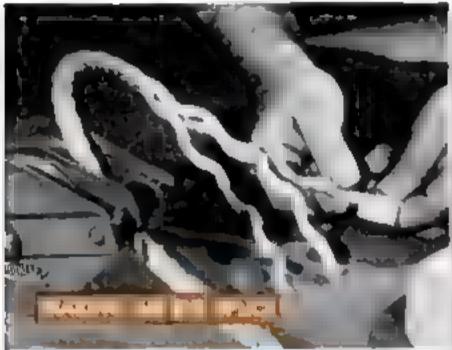
How to Rig a Load

To MAKE full use of the surprising strength of light gear, you need sturdy support for it. An A frame works fine, but a hefty tree limb or a two-by-four firmly fastened to rafters will serve, too. If you just want to drag a heavy object, try these supports for your blocks: outdoors, solidly driven stakes; indoors, a two-by-four placed outside a window so that it straddles several study of the house wall.

Carefully rigged ropes are just as important. Professional riggers use knots, but only when splices won't do. Even a well-tied knot may reduce lifting capacity by a third, while a good splice is almost as strong as the rope itself.



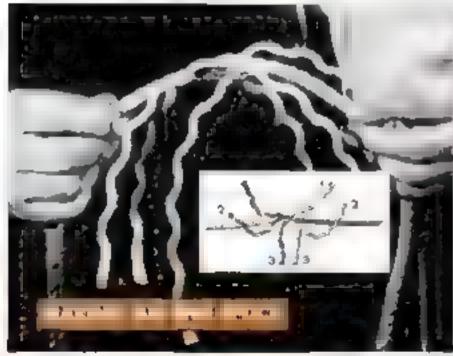
TWO-BY-FOUR nailed across attic rafters supports block from short sling. Note champs to prevent nails from loosening. Other supporting arrangements are shown in sketch above.



THE LATIN TVE EPLICE is started by untwisting three strands for about 6" and wrapping the strandends with tape (to prevent unraveling).



PARTIALLY UNIWIST body of rope at point that will give eye of desired size and tuck strands through. They should emerge at 180° angles.



TO JOIN TWO ROPES or make endless sling, use end splice. Untwist ends, interlace so strands of one end are separated by those of other.



TIE MATCHING STRANDS with overhand knot and pull taut. Strands should now project from rope at 120° angles.



EYE SPLICE is best method of attaching standing end of rope to thimble at bottom of upper (fixed) block. Two half hitches could be used, but would not be nearly so strong.



RISK OF SLIPPING KNOTS is avoided by wrapping load in slings. Endless sling (left) is loop of rope made by splicing ends together; double-eye sling (right) has eye at each end.



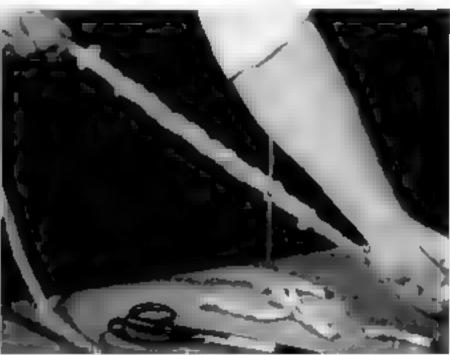
POINTED DOWIL opens path for additional three or four tucks, strands always being pulled tight after each tuck is completed.



SPLICE IS THEN TAPERED by thinning strands about one-third and continuing tucking with thinned strands until splice is completed.



TUCK STRANDS through, opening rope with pointed dowel. Tucks are made over strand to your left, under the next strand.



FINISH END SPLICE by thinning strands and continuing tucks for a total of eight or 10 tucks. Splice is 85 percent as strong as rope. END

Two Ways to Make Concrete Walks

The old reliable paving still rates at the top on all points: looks, economy, serviceability.

You can't beat concrete for walks. Neat and attractive, it is generally also the cheapest, smoothest and most durable of paving materials. And it's easier to lay than you may think, whether you pour it is place or assemble prepart blocks.

it in place or assemble precast blocks.

Poured concrete needs no gravel base if the soil is reasonably well drained and tamped firm. Scrap lumber makes the forms, and you can re-use it when you're through. For small jobs, concrete can be mixed in a wheelbarrow, but if you need very much, it is wiser to rent a mixer or have ready-mixed concrete delivered.

Precast blocks—available in many shapes—cost a bit more, but require less digging and no forms at all. For stumble-free smoothness, they should be laid on a %"-deep base of gravel or cinders covered by %" of sand. A layer of salt under the cinders will help keep weeds from edging through joints.

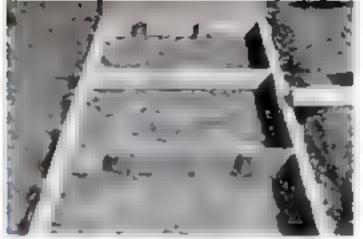
Blocks make quick-and-easy concrete walk



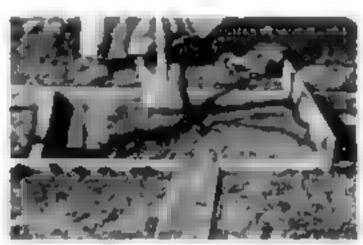
"SILO STAVES" is what these factory-made slabs of solid concrete are called. Their tongue-and-groove edges make a smooth joint, but they should be laid loosely enough to allow for expansion and drainage.



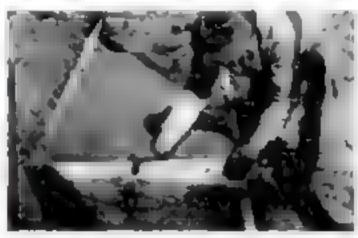
WALKS for different uses are easily obtained by changing the direction in which the 10"-by-30" slabs are laid. Ground need only be dug out about 1" deep to allow for a shullow base and Staves.



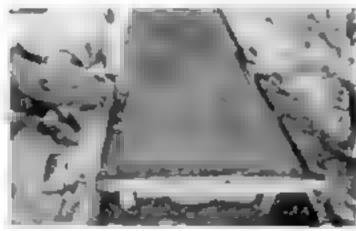
FORM for poured-concrete walk is two-by-fours, well staked, with lighter crosspieces to provide expansion joints. Ground should be dug out to bring walk at least 1" above grade. Pitch slightly for drainage.



ALTERNATE SECTIONS are filled with mix, which is spaded against the form boards. After these are hard enough to be self-sustaining, remaining sections are poured.



STRIKE BOARD—any straight scrap—levels concrete after preliminary smoothing with shovel. Portland Cement Association recommends that same mix be used for the full thickness of the sidewalk.

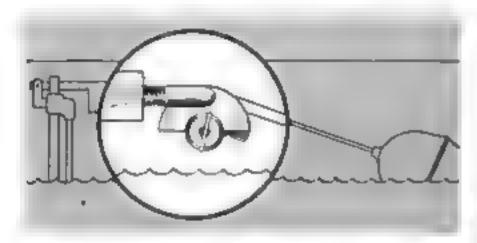


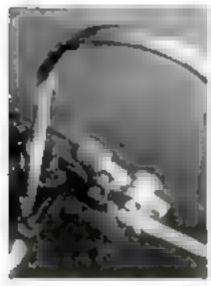
WOODEN FLOAT worked over leveled concrete gives smooth surface with enough roughness for safe footing. Edge can then be grooved (above). Cover walk with wet paper for 72 hours to allow curing.



1. Can Keeps Brushes Clean. Several paintbrushes can be stored in this container and carried conveniently from job to job. A rack supports the brushes so that bristles are kept straight, and a plastic cover keeps out dirt. The rack and top will fit any standard rectangular gallon container so that the brushes can be quickly transferred from a can of cleaner to a clean, dry can for permanent storage.

2. Wood Comes in Rolls. Only five-thousandths of an inch thick, this finely shaven wood can be put up like wallpaper with ordinary paste or applied as a decorative veneer to wood, metal, paper and other materials. Bonded to a thin paper backing, it is flexible, tough and takes wax, stain, varnish and other wood finishes. It comes in 10 different woods in 27%"-wide rolls from 32' to 328' long.

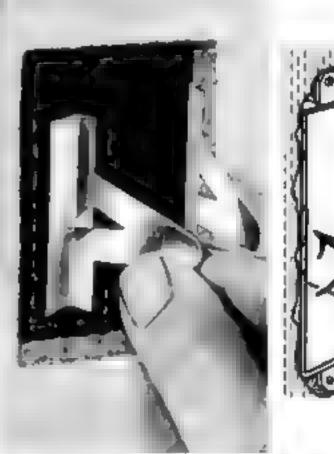


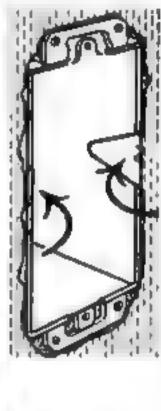


3. Adjuster Changes
Float Angle. Leaky
toilet valves can be
quickly fixed with this
float adjuster without
bending the float arm
or replacing the valve.
The threaded adjuster
screws between the
valve and the float
arm, permitting the
float angle to be

changed as the valve wears. It's also said to save water by enabling the float to close the valve at a lower level.

Further information on these products can be obtained from: 1 E & 1 Enterprises, Inc., 662 Bloomheld Ave., Ferona, N I 2 Do at Fe-down and Associates, 504-6 Keith Building, Cincinnate 2, Ohio; 3, The Leonard Co., 506 Third Sc., Des Moines, Iown; 4. Hiles Engineering Co., Genoa City, Fig.





4. Brackets Hold Switch Box. These metal brackets will hold an electrical switch box in wallboard and other soft materials where there is no nearby stud for support. The sharp points on the brackets are first pressed into the wallboard's edge to give a good grip (left above). Then the box is set in and the tabs bent around it to hold it in place (right).

Now It's Easier to Paint a House

New paints for every purpose and ingenious tools to apply them help weekend painters get professional results.

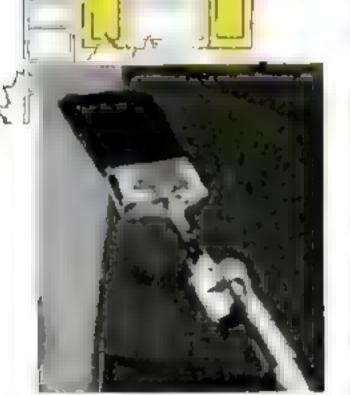
By Bernard Gladstone

AMATEUR house painters never had it so good. Scores of new paints and gadgets placed on the market in the last few years make it possible for the weekend handy man to paint his own house almost as easily as a professional. From one-coat paints to disposable blowtorches, everything has been designed to make the job go faster, look better and cost less.

With the new outside rollers, you can paint an averagesize house in a couple of days, Add an extension handle and you can roll a terrace without stooping down, reach a roof without leaving the ground. Specialized aids with built-in know-how tackle the hard spots for you.

Better still, you don't have to spend hours getting ready and hours cleaning up afterward Premixed paints, electricdrill attachments and self-dispensing calking guns make short work of preparation. Cleaning up is a soap-andwater job for the rubber paints, or a quick dip in special cleaners for the oils. Disposable dropcloths and paper paint pails are used once and thrown away.

Here are some of the tools of the amateur's trade that make it easier to paint your house than ever before—not the way the pro does perhaps, but with much the same results.



PAINTERUSH ON A POLE spreads paint on the high spots with-out special ladders or scaffolds, is one of many new gadgets that help amateurs do a professional job. Holder above takes either brush or roller, fits on mop or broom handle and can be set at any angle to get in corners, crevices and under overhangs.

BADLY RUSTED METAL can be covered over with this new paint, saving work of cleaning metal first. Paint stops rust chemically, comes in several colors and can be used as finish cost or as undercost for regular paint. SPRAY CANS get in where brushes won't reach, are easy way to paint acreens, shutters, iron grillwork. Screens stacked this way can be sprayed three or four at a time to save paint. Spray screens from both sides.



ING POPULAR SCIENCE



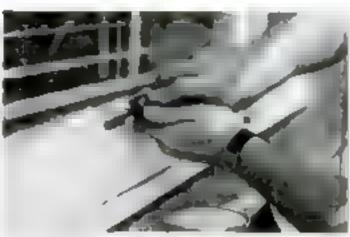
ROUGH SPOTS on old paint are quickly smoothed down with sanding wheel in electric drill. Same treatment with wire-brush wheel (in foreground) takes rust and scale off metalwork. Cracked and peeling paint can be removed with several types of hand scrapers. Small scraper at left above gets in tight spots.



DISPOSABLE BLOWTORCH takes off heavily built-up or alligatored paint, needs no pumping or priming, is simply fitted with new tank when old one runs dry. Wide-mouth hurner tip spreads flame over large area. Long-handled scraper keeps fingers out of way.



CALKING GUN fills cracks around windows, doors, needs no cleaning since barrel is disposable cartridge, replaced by refill. Calking compound can be painted over immediately.



V-SHAPED PUTTY KNIFE sprends smooth, professional bead of putty along window such. Loose old putty should be removed and window primed before new putty is applied.



EXTENSION RING fits top of paint can, making it easy to mix paint and add thinner without spilling. King has its own hid so it can be left on and paint kept covered.

RUBBER-BASE MASONRY PAINT lets you put a quick coat on brick, stucco or cement without mixing up powders or using special undercoats. It comes ready to use, is waterproof, can also be used on asbestos shingles.

YOU CAN ROLL PAINT ON a concrete porch or outdoor terrace with an extension handle and this rubber-base enamel. Enamel is tough, wears better than ordinary concrete paints, is not affected by moisture in exposed slahs.



Please turn the page for more paint photos.

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EXTERIOR ROLLERS now let you paint outside with the same case that you use them inside. Small doughnut-shaped roller (left) gets in corners, under edges of clapboards and between joints in vertical siding. Then large

coller is used to fill in broad areas (right). Special long-nap coller also puts paint on brick, stucco and other rough-surface masonry. Paint tray clamps to side of ladder, can be adjusted to any angle.



MINIATURE ROLLER lays narrow ribbon of paint on window each without getting paint on glass. Roller comes with its own trny paint tray, has metal tip that rules against glass to keep paint from smearing. Another type of such painter (on window sill) has plush pad set in plastic hundle. Pad is saturated with paint, then wiped along such with plastic edge held against window to keep paint off glass.



EASEL FOR PAINTING SCREENS and storm windows is made by clapping special wire hooks to stepladder rung. Hooks also serve as paint-can holders for working atop ladders.



YOU CAN STAND ON GROUND and still reach first-floor roof overhangs with roller on extension handle like this. You paint as fast as you walk, don't have to keep moving ladder. Same extension will reach second-floor overhangs from stepladder.



TRICK LADDER does several jobs in one. As stepladdee (above), it stands 7', lets you reach well above first-floor line. By locking one half to other, it converts into 13' extension ladder (below), for reaching high spots. Halves can also be used separately as short ladders so two persons can paint at once.





DISPOSABLE DROPCLOTHS keep paint off shrubs and walks. Made of paper, they're cheap, light, won't damage bushes and flowers, can be used several times.



ROLLERS are quickly cleaned in tank of special fluid. Roller is simply dropped in and tank shaken like cocktail for one minute. New ring-shaped scraper is then slid along roller to squeeze out the excess cleaner.



PAPER PAINT PARS save buying and cleaning expensive metal ones, are handy for mixing. Costing only a few cents, they're used once, then thrown away.

WATERLESS HAND CLEANER takes off both oils and rubber-paint, will not irritate skin as solvents may. Paste is simply wiped on hands, then wiped off, taking paint with it END



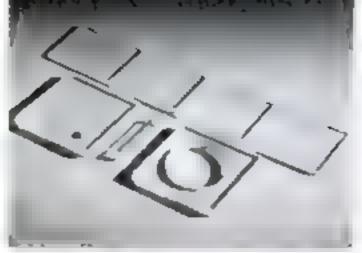


Plastic Box Makes Tricky Lighter Base

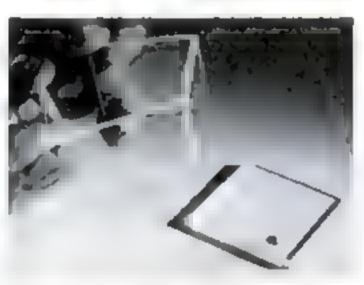
Filled with mineral oil, it looks like a solid cube, and you see the ornamental figure twice.

ALTHOUGH the figures you see in the base of this table lighter appear to be molded into a solid block, they are actually submerged in a hollow plastic box filled with mineral oil. There is only one hobo in the oil-filled box, but the refracted image appears on two sides. This is because mineral oil has the same refractive index as clear plastic—both bend light rays to the same degree. Without the oil, it would appear to be just a figure in a plastic box. The lighter came from a craftwork supply house. The box was made from sheet plastic. M. J. Moch, Jamaica, N. Y.

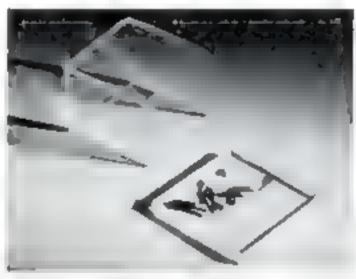
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CUT PARTS FIRST. Sides of hox are bent from long strip with V cuts nude with saw set at 45°. Small hole in bottom is later plugged with rod,



BEND SIDES. Heat each V cut gently until soft, then bend 90° to form box. Bring ends together and check squareness. Then cement them,



CEMENT FIGURES to bottom and cement sides in place. Dip edges in shallow tray of solvents press parts together firmly for clear joints.

CEMENT TOP OVER SIDES and, when dry, bevel the top and bottom edges to conceal the joints. Sund smooth and buff clear. Force lighter into hole in top, turn upside down, fill with mineral oil, and allow to stand until all bubbles rise. Then drive a 14" plug into the hole, cut it flush, sand smooth and buff lightly to avoid warming and expanding oil.



POWER PLANT at right drives a balsa plane into the sky as seen in the dramatic picture below. A wire clip holds cap on motor case and aligns motor in bracket. A wood strip represents the keel.



Turboprop Flies Model

Gases from a miniature jet engine whirl a tin-can turbine which in turn spins the prop to keep the plane in air.

By Roy L. Clough Jr.

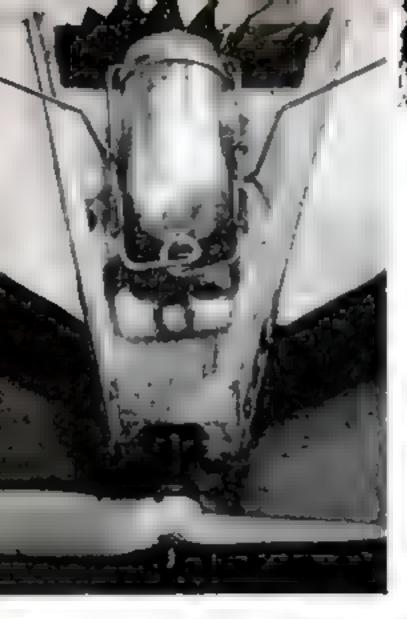
THE hissing power of a miniature jet engine is harnessed by a turbine to spin the prop on this model plane—just as on a real turboprop airliner. The prop does most of the pulling, but the jet thrust helps, too. Flights of about 150 feet can be expected

Power plant. The jet power is sup-

plied by a Jetex 50 solid-fuel motor, available in model-supply shops. A small pellet of compressed fuel burns rapidly, emitting exhaust gases under pressure through a tmy hole in the metal case.

Construction. Four 1-16" balsa bulkheads (stations A, B, C, D) cemented to a flat keel shape the fuselage. The wing, cut in one piece, is laid across the keel and





RACKET is set at a slight angle to left (looking nose). It also secures the landing gear, that comes with motor insulates the keel.



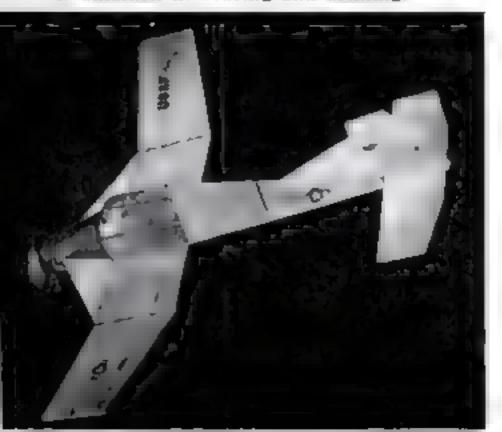
PROP-SHAFT BEARINGS, cut from tin-can stock, are cemented to the top surface of keel. Opening is cut in keel for turbine after fuselage stringers are in place.

cemented in place. Dihedral is added by scoring, bending and reinforcing the bend with cement.

Rudder, stabilizer and wing fillets are cemented in place after the fuselage is covered with tissue; cowl cheeks are added after installing the motor bracket and landing gear. The bracket is set off-center and at a slight angle, to reduce the side thrust of the jet as the gases are deflected by the turbine vanes.

Prop shaft and turbine. Bearings for the prop shaft are cut from tin-can stock and cemented to the top surface of the keel on the centerline. The turbine is made by cutting 16 vanes in a 19/16" tin disk and twisting them about 45°. It is then set into an opening in the keel and soldered to the

FROM ABOVE, the model tooks like this. The wing is cut from 1/16" sheet balsa. Dihedral is obtained by scoring and bending.



back end of the propeller shaft. The propeller is forced on a short length of rubber tubing slipped over the end of the shaft. This will hold it in place for flying, yet permit easy changing of props to determine the best pitch.

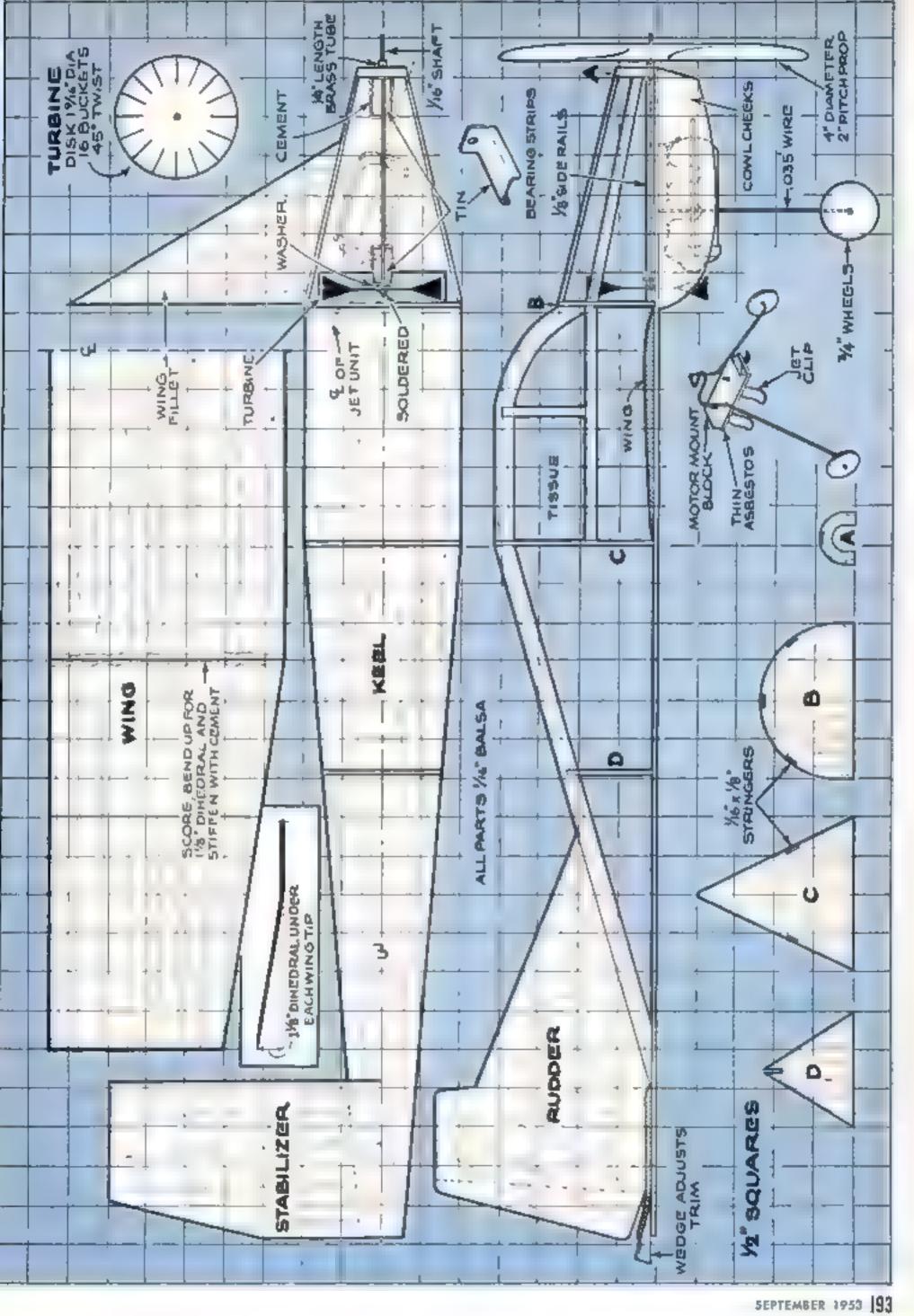
Flying. The trim of this model is unusual because the center of gravity shifts during flight. It should be balanced for a floating glide without a fuel pellet in the motor. A wedge pushed under the stabilizer will keep the nose up if needed.

Flying under power with the weight of the fuel holding down the nose, the model will travel on the level for some distance, then go into a gradually steepening zoom as the fuel pellet is consumed and the motor peaks.

The midder is bent to the right a bit to counter the jet deflection, which tends to force the plane to the left. Best bet is a struight flight or a gentle left bank as gyroscopic forces of the turbine and prop tend to raise the nose in a left turn and depress it in a right turn.

Cautions. The prop should not be held, once the jet starts perking; heat concentrated on the turbine might melt the solder that holds it to the shaft. If the plane noses in, it should be picked up immediately to let the turbine spin. A thin solution of sodium silicate (egg preservative) or sal ant-moniac painted inside the cowl cheeks will keep them from being scorched.

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New for Your Car

1. Shade Keeps Convertible Cool. You don't have to come back to a scorching seat every time you leave your convertible on a hot, sunny day. Just pull out this shade, hook it to the

steering wheel, and the seat will be cool and comfortable when you return. When not in use, the shade rolls up into a chrome-plated metal cylinder on the back of the seat. It

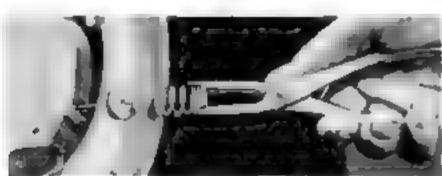


also keeps out dirt, prevents dew from forming on the seat, and saves wear and tear on the regular top since it need not be raised and lowered as often.

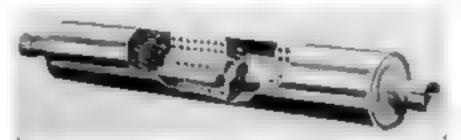


2. Light Warns of Brake Failure. If your brake fluid falls below normal level, this dash light flashes a warning, giving you time to pull in for a checkup before an accident occurs. The light is triggered by a

float-actuated switch that's screwed into the master cylinder's filler hole replacing the regular filler cap. If the fluid level falls, the float drops, closing the switch and lighting the lamp.



3. Pliers Remove Brake Springs. The tiny hold-down springs in brake assemblies can't slip or spring out of place with these special pliers. The hooked tips grip the sides and a circular tab holds spring and washer firmly together so both can be removed or inserted with one hand.



4. Power Muffler Wears Longer. This new muffler is said to have the high-power and fuel-saving advantages of straight-through types without the disadvantages of lost packing and hot spots that necessitate frequent replacement. The steel packing is held firmly in place by four perforated dividers that keep it from settling to the bottom or sifting out the exhaust pipe, and permit even heat-dissipation. Another model is available with glass-fiber packing instead of steel.

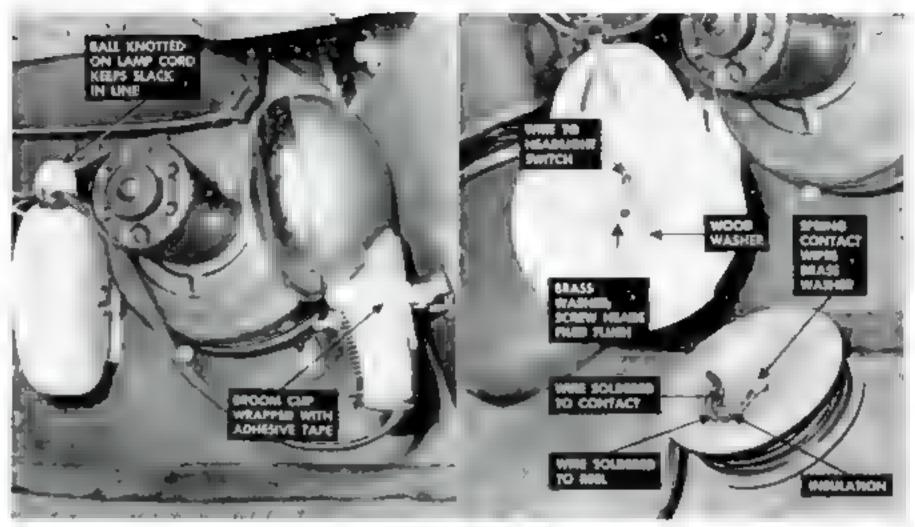
5. Aircraft Spotlight Made for Car. You can now get a spotlight for your car that's just the same as the landing lights used

the landing lights used by airplanes. The sealed-reflector lamp



produces 200,000 candle power and operates on a 12-volt electrical system. A 6-volt model is also available.

Further information an those products can be obtained from 1 Paramount Leather Goods, 779 Towns Ave., Los Angeles; 2, Wagnes Electric Corp., 6400 Phymosth Ave., St. Louis, 3, Thorsen Tools, Emeryville, Calif., 4, National Engineering Corp., 1122 W. Venice Blvd., Los Angeles; 5, Charles E. King & Co. 960 W. Chicago Ave., Chicago,



This Auto Trouble Light Winds Itself Up on Reel

I cor tired of plugging my auto trouble light into the cigarette-lighter socket every time I wanted to use it. Now I have a light that's permanently connected, ready for instant use, and it winds itself in and out, saving fussing with a long, tangled cord. First I bought a spring-loaded clothesline reel, removed the line and wound on the light cord. On the inside of the cover I

serewed a wood washer for insulation and a brass washer on top A spring contact on the reel, connected to one lamp lead, wipes the washer as the reel turns. The other lead is grounded to the reel. From the washer I ran a wire to the hot side of the headlight switch and screwed the reel to the firewall to complete the circuit.—R. L. Hanson, Middletown, R. I



Peephole in Visor Spots Traffic Light

A small hole in a sun visor (above) will make it easy to see overhead traffic lights that are often hidden by the visor. Locate the best spot by sighting at an imaginary light, then cut a 2" hole in the metal visor and smooth the edges. Cut a circle of clear plastic slightly larger than the hole and make a retaining ring for it out of aluminum or other nonrusting metal. Drill and tap the ring for machine screws and mount the sandwich on the underside of the visor. A small drain hole drilled in the plastic at the lowest point will keep water from collecting.—W. E. Burton, Akron, Ohio.

Clip Holds Cigarette

A SPRING-TYPE paper clamp will make a convenient holder (below) for a lighted cigarette while you're driving. Grind away half of the eyelets, enlarge the holes if necessary and clip the clamp to the ash tray. Keep the holder in the glove compartment when not in use.—Ken Murray, Colon, Mich.





A jangling phone cuts into Gus's peaceful dreams with a real nightmare out at the Gantner place.

By Martin Bunn

MORNING was still a smoky gray, pierced only by the ticking of a clock and the sounds of heavy sleep. Sunday, at that hour, was never disturbed by the rattle of milk bottles, or the usual shriek of hot shave water through old plumbing. Maybe that was what made the sudden jangle of the telephone so grating.

Gus Wilson groaned and tried to shut out the sound. But it chased him around the edge of his pillow. Blindly he reached

for the receiver.

"Gus? This is Billy Ryan. I hate to bust up your dreams, but we need your help."

"Help! Listen, Billy. This is no time to be playing cops and robbers. Why don't you climb into your patrol car and drive out to East Mountain? They say the sun-

rise there is real pretty."

"That's where I am now. There's a truck stalled here on the grade with a conked-out engine and a load of telephone poles. The way those logs are shifting it won't be long before the cables snap. When they do there's a little house right below the roadthe old Gantner place, you know-that's going to look like Home 1 after the Yucca Flats atomic-bomb test."

By now Gus was coming to.

"You pick me up in front here," he said.

Billy's Patrol Car Skids to a Stop

Gus put his hand on the door handle as Billy Ryan's patrol car squealed to a stop. "Okay, Billy," he said. "You can fill me in

on the way."

"There isn't much to tell," Ryan began as they sped away. "The truck driver called the station from this house that's practically under the load. Said he was hauling the poles for a replacement job when the engine died halfway up the hill. It was too dark to back down, and he didn't want to trust his brakes to hold him. So he backed onto the shoulder, figuring to pull out as soon as he located the trouble."

"Only the engine wouldn't start," Gus in-

terrupted, "and the outward slant of the road kept pulling on the load until the

cargo started slipping."

"You're right about the poles," Ryan said, "but not about the engine. She'll start easy enough, but she peters out every time she's forced beyond an idle. I've got the Gantners up on the road where they're safe enough. But that place of theirs is going to be leveled if those poles let go. Be a shame, too; old Julius Gantner built it himself, back in the '60s-the first house up in that neck of the woods—and it's been home, now, to four generations of Gantners."

Gus scrutched his head. "How about my tow truck?"

"No good. Only a cat could wrestle that dead weight up the grade."

"Can we shore up the poles?"

"Not a chance. The slope above the road is bare; nothing to wind a cable around."

"What happens if I get the engine fixed?" "Then he's going to take off up the hill as fast as he can. If he can push his luck as much as 50 yards, the house will be safe."

The Trailer Leans Drunkenly

The sun was just tipping the pines when the road broke through a slash in East Mountain, and they saw the truck, high on the shoulder of the bald ridge beyond. Its long flat-bed trailer leaned drunkenly under the cargo of poles, directly above a splash of earth that fell off sharply toward a small house plastered against the side of the ravine. Four small figures standing at the side of the road added a final touch to the cheerless scene. Three of them would be the Gantners-Tom Gantner, old Julius' grandson; his wife, Mary, and their teen-age daughter, Susan-the other, the driver of the truck.

Billy Ryan eased to a stop a hundred feet behind the trailer.

"It's your move, Gus," he said.

Gus trotted ahead, nodded to the stocky driver who came forward to meet him, and noted with approval that the hood was already up, the engine running, and the tools laid out on the fender.

"Sure glad to see you, Mr. Wilson," the driver said. "I'm Bill Berry. Guess you know the rest of the story."

"Ryan's been briefing me," Gus said. "Engine idles okav, but dies out when you pour on the power. Anything else?"

"Not much. There was a little sputtering the last few weeks, so I had the fuel line blown out yesterday, and a new fuel pump put in. She ran fine after that."

He was interrupted by a faint but omi-

nous creaking.

"Hear that? Those poles are still shifting. Cables can't take that strain forever."

Tom Cantner had moved up quietly on the other side. His face was tense.

"I've heard you are a good mechanic . . . "

His voice trailed off.

Gus turned from a quick inspection of the ignition system and smiled

"I'll do my best, Mr. Gantner."

Plenty of juice danced against his screwdriver at the plugs. The points in the distributor were good and there was no sign of a short.

There seemed to be plenty of output in the coil and the condenser looked okay.

With ignition crossed off the list, it was plain the engine was starved for gas. Gus began twisting the regulator screw on the carburetor. When he was sure that any richer mixture would drown out the plugs he pulled the accelerator arm. The motor coughed and died.

At a word from Gus, Berry climbed gingerly into the cab and stepped on the starter. The engine ran for a minute or two at idle, then died again. Gus puzzled a moment, then leaned the mixture down to its original strength. Berry started the engine again. This time it didn't die—not until Berry tried to increase its speed.

Looking for leaks, Gus traced the fuel has from the carburetor to the tank, wiping away grease and dirt, prodding, prob-

ing, but finding nothing.

He had been listening for a thin hiss at the intake mainfold. The fact that he couldn't hear it didn't mean anything; a bad leak might lower the pitch and make it harder to detect among the other noises.

"Have you some light oil handy?"

Berry dug a can of household oil out of the running-board toolbox and Gus dropped a little around the manifold gasket. None of it was sucked in at the seal.

"That's out." Gus scowled. "I thought maybe your manifold facing might be warped from overheating, or that the gasket

was shot."

Whatever it is, he told himself, it's right under my nose. Some small, simple . . . Wait a minute!

Gus was looking at the filter unit, the small glass cup with the ceramic filter. "Shut her off," he called to Berry.

Disconnecting the cup he mopped it out with a chunk of waste, wiped off the filter and put the unit back in place. There had

been at least a spoonful of red silt at the bottom of the bowl.

"Now start her up again and gun her."

Berry cranked the engine back to life and bit the gas. This time the engine roared for a moment before conking out.

Gus took the cup off again and studied the intake and outlet

tubes. They looked all right. He put the cup back, minus the filter. That would let him watch the flow of gas into the unit.

When Berry bore down on the starter the fuel jetted in with healthy bursts that quickly climbed to the level of the outlet tube. An instant later the engine caught. Gus shouted to Berry: "Gun her!"

The engine burst into a full-throated roar and stayed there, bellowing sweetly.

The Ponderous Cargo Teeters

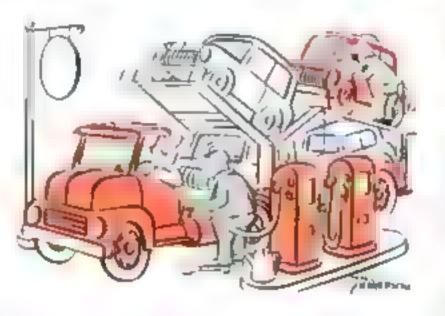
Berry didn't wait to ask questions. He put the truck in gear and inched ahead letting the engine take the strain gradually. Five feet. Ten feet. The ponderous cargo of poles teetered perceptibly. But somehow the cables held.

Tom Gantner grabbed his wife and

daughter and shouted with relief.

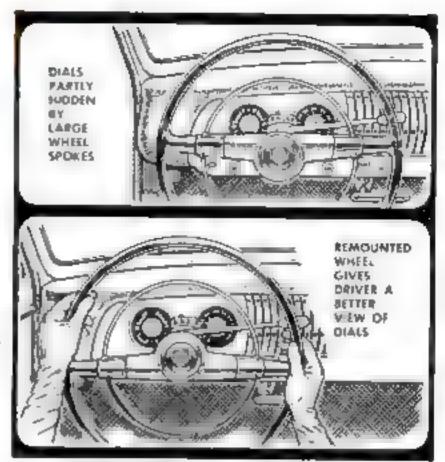
"He's made it! By jingles, that boy has made it. Sounds silly to say it, maybe, but Gus Wilson's saved the old homestead!"

[Continued on page 250]



FROM THE MODEL GARAGE FLATTEN JAWS SUGHTAY

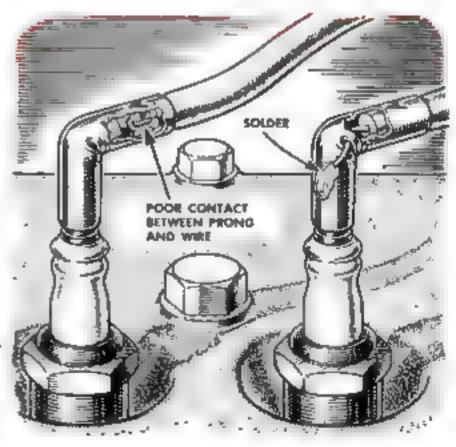
A wrench made from hardened copper tubing makes it easier to open and close a cooling-system petcock under the car. As you open the petcock, the coolant will run down the tubing, not your sleeve. Drill a hole in the end and hang it on a nail.



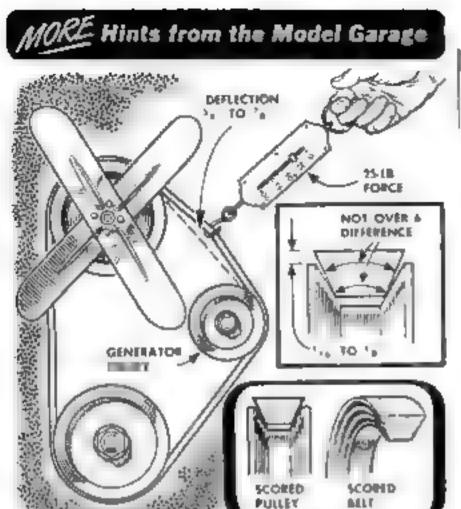
How high you sit may determine whether you have a clear view of the driving gauges through the steering wheel. On late cars with two-spoke wheels it sometimes helps to pull off the wheel, turn it 180° and remount it with the spokes below the center.



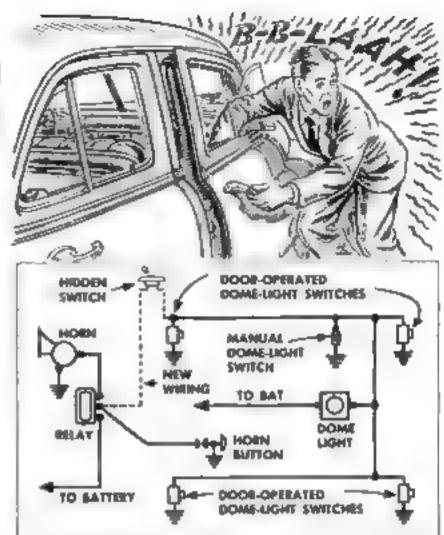
For emergencies, especially if several of the family drive, post a list of essential telephone numbers in the car. Include the policy number of your car insurance as well as the numbers of any personal-accident or hospital coverage that you have.



Hard starting may result from a faulty contact between the spark plug wire and connector. In such cases, one mechanic suggests stripping back the insulation, replacing the connector and soldering the bare wire to the side of the connector.



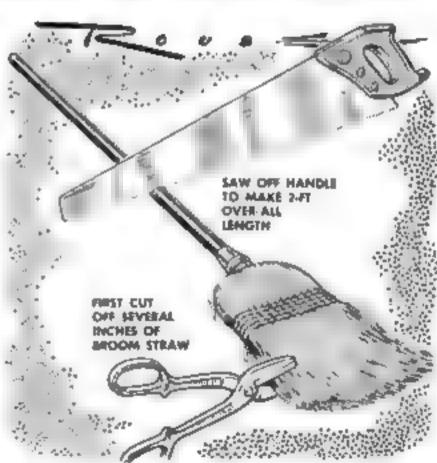
Fan-bolt life may be shortened by any of the reasons indicated here. In installing a new belt, always make sure it is engineered (in cross section) to fit your particular pulleys. If a pulley is scored, your belt eventually will become scored too—and weakened. If too tight, the belt will damage water-pump and fan bearings.



A simple and effective burglar alarm can be installed with a length of wire and a single-pole switch. Use the wire to connect the horn and courtesy-light circuits through the switch. If anyone opens the door, the horn will blow. Hide the switch somewhere on the exterior of the car so you can shut off the alarm system.

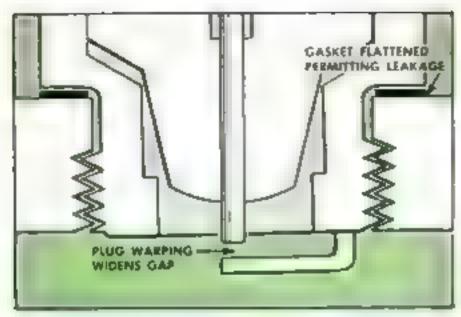


If static sparks crackle from your fingers when you slide into or out of a car equipped with plastic seat covers, try keeping your hand on the door handle until you are settled or out. This will carry off the charge from your body.



A handy brush for cleaning road dirt from the underside of a car can be made from a discarded household broom. Shorten the handle with a saw and snip about 6" off the bristles, leaving just enough so you'll have a brush that's good and stiff.





TOO MUCH TORQUE is as bad as too little in scating a spark plug. If the gasket is flattened so much that gases leak from the combustion chamber, you lose compression and overheat the plug, shortening its life. A beavy hand with the wrench also may warp the bottom shell, pulling the electrodes apart.

three different reaches (lengths of threaded sections) of plugs in the 14-mm. size. They are 3", 3" and 3".

We have found that you can't put the longer-reach plugs in an engine designed for a X" reach and expect efficiency. Neither should you put X"-reach plugs into holes designed for longer ones. The same thing is true, incidentally, in most American passenger cars where we have both X"- and 7/16"-reach plugs in the 14-mm, size.

Here's what can happen. The main trouble with installing a long-reach plug in a short-reach hole is that the bottom threads extend into the combustion chamber and can become coated with fuel deposits. Not only will the end of the plug overheat and cause a probable power loss but the threads in the cylinder head are very likely to be damaged when the plug is removed.

Conversely, when a short-reach plug is placed in a long-reach hole, it's the exposed cylinder-head threads that become fouled with carbon-like deposits. Later, when you install the proper-type plug, the end will hit those clogged threads and prevent proper seating of the plug on the gasket.

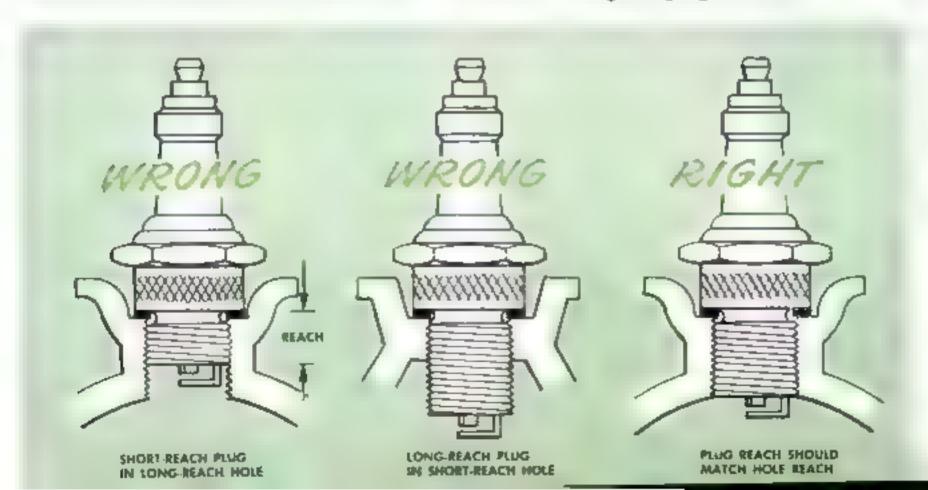
This situation of the too-short reach can pile up a number of troubles. The higher position of the firing end will tend to delay combustion, giving the same effect as a slightly retarded spark; the unfilled cyboder hole will increase the combustion-chamber area and may affect compression; and the plug undoubtedly will overheat.

Heat range. This is the next consideration in proper plug selection. Over the years spark plugs have been designed, laboratoryand road-tested in all types of equipment to check and rate their ability to dissipate heat from the firing end.

Selecting a plug in the right heat range depends largely on driving conditions. The car maker has tried, in the sports-car as well as the regular-car field, to specify a plug for all-around service. But in many cases the ordinary car driver will never drive at highest speeds; most of his driving will be in slower stop-and-go city traffic.

In city traffic, then, the plugs may run too cold and accumulate deposits which in time will short the firing end of the insulator and cause the engine to misfire. In this instance, it is our policy to install a plug one step hotter. On the other hand, if a plug operates too hot in an engine, the life of the electrodes will be shortened. And under some high-speed driving conditions, the plug may build up such heat in the combustion chamber that it will cause pre-ignition and detonation.

Fuel can affect heat range. We know; we've had the headaches. More than once our crew has serviced a racing job, adjusting the gaps with Swiss-watch precision and installing the plugs in accordance with



the best practices. We've watched the car in a practice run, the cadence of the ex-

haust sheer perfection.

The next day things go wrong. The multi-thousand-dollar special sputters back into the pits with the plugs badly fouled. Once we were puzzled. Now we get the solution by asking "what've you got in the tank?" Racing engines are critical and switching from gasoline to cooler-running alcohol—or back—definitely can affect spark-plug heat range.

Proper installation. You'll note that in many garages a torque wrench is used to tighten down the head properly so that the head gasket doesn't burn out. This same problem arises in spark plugs as we are trying to dissipate heat from the spark plug

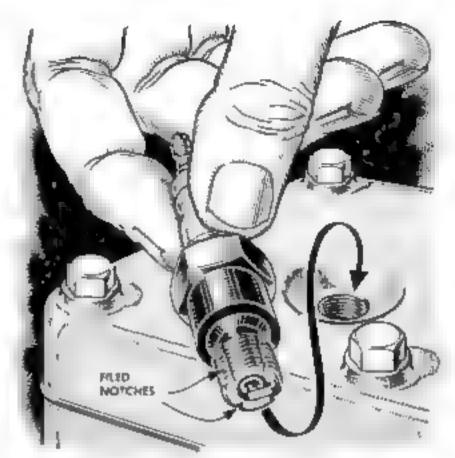
through the little copper gasket.

Improperly installed plugs may indicate, when removed, that they are operating at too high a temperature—electrodes may be burned and the insulators very white in color. This appearance might seem to indicate need for a different type of plug. But just looking at the firing end doesn't always determine whether such a change should be made. First, examine the outside copper gasket to check proper installation. After that, if installation is satisfactory, is the time to determine whether the correct plug is being used.

Insufficient torque will fail to compress the copper gasket properly for a good seal. The resulting leak will cause some loss in compression and make the plug overheat. Too much torque may stretch the gap right out of adjustment or in the racing-type plugs may so warp the shell that the internal structure of the plug will be damaged.

Even the pros go wrong. We keep stressing correct installation because too few persons understand its importance from the standpoints of both efficiency and economy. And we're not referring merely to the average motorist, either. At the NASCAR meet in Daytona Beach last spring, we were amazed to find plugs that could be unscrewed with our fingers from engines sporting expensive special heads, cams, manifold and exhaust systems.

Furthermore, we found ignition cables cracked and deteriorated on some of these costly jobs. These conditions, of course, affect spark plugs because they're at the end of the line. As a result we organized an "ignition clinic" for several hundred drivers and mechanics and were gratified the



YOU CAN MAKE A CLEAN-OUT TAP from an old plug by filing four square-edged notches across the threads. Turn the tap into the cylinder head without a gasket and it will clear out any carbon left on the bottom threads if old plug was short or loose.

next day to see them out on the line with wrenches and gauges checking their plugs.

Real evidence that spark plugs, properly selected and installed, can contribute to surprising engine performance was supplied by Bob Pronger, a Chicago driver in the Daytona strictly-stock race.

Bob reported that he had tuned his '53 Olds on a dynamometer in Chicago, testing various types of plugs. The right combination (Champion J-6's) was an eye-opener,

Plug Facts in a Nutsheli

Select plugs with a reach to match the cylinder-head threads and a heat range to suit your driving conditions.

Gap them as recommended

Turn a clean-out tap into the cylinder-head threads and clean the cylinder-head gasket seat.

Fit a new gasket to each plug Seat to the proper tightness.

he said. The engine revved up 300 r.p.m. faster.

It paid off. Bob set a new record in the prerace time trials—113.28 miles an hour for a two-way run over a measured mile. END

Next month: Read how to use a spark-plug tester for ignition trouble shooting on cars, oil burners, mowers and outboards.







Spot This Lamp on Your Garage

You make it by cutting and bending sheet copper and soldering the parts together to look like a lantern.

MOST homes could use more light at the garage door, and that's a spot where this copper lantern will look especially good. Center one of them above the door or make a pair and put one on either side. You can also use two of them in the traditional location, the front door, or mount one on a post as a yard light.

Body. The top, bottom and back are a single piece of light-gauge sheet copper cut and bent according to the pattern. The front corner posts are %" strips of the same material bent 90° and then soldered in position. After the windowpane glass sides are put in place, small copper angles are soldered inside the top and bottom of the lamp to keep them there

Top. A strip of copper 1%" wide rolled to a diameter of 2" forms the lamp house at the top. Solder the ends of this together and then solder one end of the roll around the hole in the top of the lamp. A %" strip with a hole in the middle soldered across the lamp house provides a bracket for mounting the lamp socket. Copper spring clips soldered to the conical top keep it on the lamp house.

The door frame is made by bending

copper strips about %" wide into channel shape to fit the pane of glass. Cut the strips at a 45° angle on each end. Solder the bottom and two sidepieces together while they are squared up with a framing square. Then ship the glass in and solder the top strip in place. Be careful not to apply too much heat suddenly when using the soldering iron near the glass or it may crack.— John Rogers, Dallar.

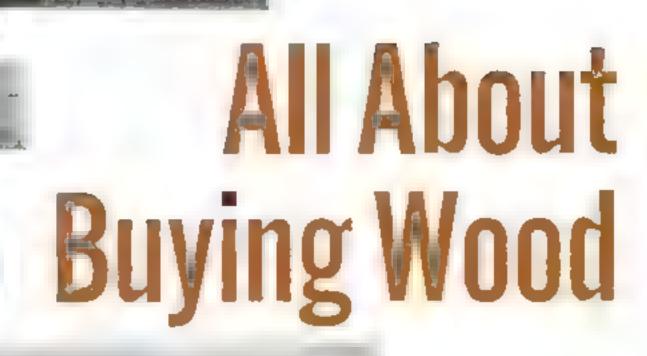


RIGHT-ANGLE BENDS in sheet copper can be number by clamping the metal between two pieces of angle iron in a vise. Then put board behind copper, bend with one motion.

SOLDER HINGES to the corner post first. Then put the door into place and solder the hinges to it. A spring clip soldered to the other corner post will keep the door closed.



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It will cost you less if you know sizes, grades and pricing methods.

ALL the miracles of modern synthetics baven't ousted wood from its spot as our number-one building material. It is easy to work, plentiful, durable and versatile. You can pick it for toughness, flexibility, beauty, hardness or softness. In the form of plywood, it comes in almost any size you need.

But the handy man who goes to the lumberyard with a gleam in his eye may come out with a glazed look and a thin wallet. Confusion about grades, dimensions, and

prices may needlessly skyrocket a materials bill.

Here's the hneup:

Actually, there is no mystery about lumber grades, sizes and charges. But the man at the stacks hasn't time to explain them. In the following pages you will find basic facts and money-saving tips about structural lumber, boards, plywood, nullwork and craft woods. These will help you decide what you need, and when to accept or reject substitute material. If you want the dealer's assistance, try to go to the yard on a weekday. Saturday is his busy day and he may not have the time to be helpful.

Wood for the home carpenterp. 206
Shopping for plywood p. 213

More plywood for less money... p. 216

Low-cost wood for craftwork p. 218

How to identify woods p. 220

Hard or soft, green or seasoned, rough or surfaced? Choosing it and using it wisely will save you time and money.

Wood for the Home Carpenter

By Edwin M. Love

THERE are three ways to buy wood for that project you're planning. All cost money, but a couple can be downright extravagant. One is to tell the yard man you want "some three-quarter-inch stuff about so big and that long" and hope for the best.

Another is to tell him what's building and let him try to outguess you as to construction, finish, and how much dough the job is worth to you. He may play safe and sell you top-grade stuff, charging you accordingly.

The third is to know how lumber is sold and figure out what you want before step-

ping out of the house. This can save you time at the yard, keep the dealer your friend and earn you a cash saving. To buy like this, you need only know some basic facts about the trade,

Hardwood or softwood? Whether the wood is easy or hard to dent or drive a nail into is not what decides its type. Some hardwoods are fairly soft, and vice versa. Hardness will vary, too, with the part of the tree the piece came from, and its moisture content. There is no sharp dividing line.

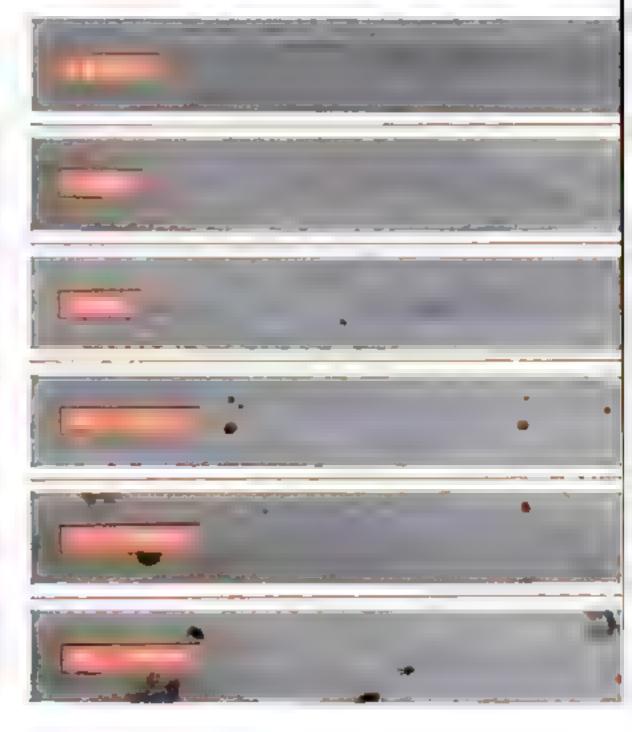
Woods are properly classified as hard or soft solely by the two groups of trees they come from. Those from broad-leaved deciduous trees (which shed their leaves each

WHEN YOU WANT BOARDS ...

By BOARDS the lumberman means stock less than 2" thick and usually over 6" wide (narrower boards may be classified as strips). Pricewise, such stock adds up fast. Therefore it's important to buy sizes that will cut with a minimum of waste, and to get the cheapest grade adequate to the job.

Grading is not an exact science, but depends upon the judgment and experience of the grader. The American Lumber Standards permit a 5 percent below-grade variation between graders. For this reason, and also because no two pieces of wood are identical any more than two thumbprints, even photos of typical grades can give only a rough idea of what may be expected. The better face of a board governs its grading. Within limits, the back may be poorer.

At the right are the six commonest pine board gradings. The sketches suggest typical projects for which each grade might be used.





PICKING OUT your own may pay even if the dealer charges for restacking afterward. You can pick straight two-by-fours for door or window frames, clear joists where strength is critical. You are free to reject supped or twisted stock you might get in a delivery.

sorting cutt tumber is one way to save money. Short lengths of the proper width, for instance, may serve for fire stops, bridging between joists, and braces. But usually you will have to square both ends of cull stock, which means one extra cut per member.

year) are hardwoods. Those from coniferous trees or evergreens, which have needles or scalelike leaves, are softwoods. Most of the wood in the ordinary lumberyard belongs to this class.

Hose dry is it? If you're putting cupboards in a heated house, the wood had better be well seasoned or you'll wind up with cracks where the joints used to be. For exterior work it can be less dry, and for framing a house even poorly seasoned lumber will do in a pinch. Such wood is easy to nail, can be straightened if crooked, and will be fairly dried out, if the weather stays



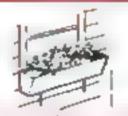
B AND BETTER (also called 1 and 2 clear) is top quality, almost free from blem-ishes, and practically perfect even on the back. It's a luxury unless intended for the finest natural finish.



c setter may have more defects, but all are minor ones such as small tight knots and small to medium pitch pockets. It will take a nice natural finish and is a fair substitute for B and Better.



b SELECT is the lowest grade of finish lumber, with medium or loose knots and other faults. The back may have more serious ones. But face defects can usually all be hidden by paint.



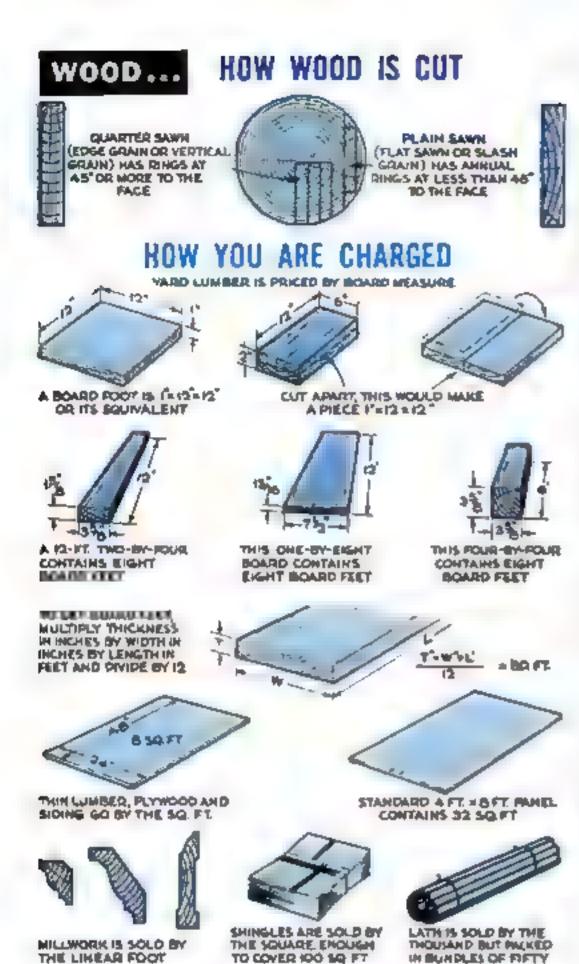
NO. 1 COMMON may have many small, smooth knots, all sound, none larger than about 2", and rarely on edges. Surfacing around knots is smooth. Paint hides most but not all its defects.



NO. 2 COMMON, an all-around utility grade, has the same defects as No. 1 to a greater degree. Knots may be up to 3½", though the average is much less. Even paint won't hide all its faults.



NO. 3 COMMON allows bigger, coarser knots, loose knots and knotholes, as well as some shake splits and pitch. Often a single large flaw will downgrade a No. 2 to No. 3.



YO . AY for the amount of wood in a piece before surfacing, for example, stock dressed to 13 16" is called 1" stock and priced accordingly. A surfaced two-by-four is considered 2" thick and 4" wide although it measures %" less each way. A board 1 1/16" thick will be charged for as 1 \(^4\). Wood thinner than 13/16" involves extra labor and more waste, so it is sold by the square foot, which is the same as taking its thickness to be 1".

HOW A TWO-BY-FOUR DWINDLES

ROUGH LUMBER BURRACING ONE SURFACING ONE SURFACING ALL ADOUND LEAVES THICKNESS IT THIS SIZE

WHY IT MEASURES LESS than the size you buy. Shrinkage accounts for some of the difference, surfacing for the rest. Standard 1" boards dress to between ¾" and 13/16" thickness, lose ¾" to ½" in width. good, by the time you get around to enclosing it.

Green wood may be so wet it spouts water when a nail is driven in. You can sometimes buy unseasoned stuff so much cheaper that it may pay to "stack and stick it" yourself for air drying (see PSM, Nov. '51, p. 177). Or you may be able to put it up green in such a way that the opening of joints won't show. One dodge is to nail battens along the joints to one board only, and nail them to the other only after shrinkage has occurred. The wood is, of course, left unpainted. Remember that wood shrinks least lengthwise, and most across the grain. In a long board, however, even lengthwise shrinkage can open a comer joint half an inch.

If you want to test wood for moisture content and shrinkage, saw off a piece 1" long and exactly 6" across the grain. Weigh it carefully. Bake in the oven at 212° for at least four hours. Then measure it or compare it to an undried piece of the same stock. If you want moisture content, find the difference between wet and dry weight, and divide the difference by the dry weight. Example: a piece weighing 12 oz. originally and 8 oz. after drying (difference 4 oz.), dividing 4 by 8 gives %, or 50 percent moisture content.

For interior applications such as trim and cabmets, lumber should be kiln-dried. Such stock may have from 6 percent to 12 percent moisture content. Framing lumber may be either kiln- or air-dried and have up to 20 percent moisture. Anything with more than that is usually considered green lumber. Beware of painting such wet wood; chances are the paint will not hold, but only retard seasoning.

Rough, surfaced and worked. Lumber comes from the saw cut to nominal sizes such as two-by-four, two-by-six, four-by-four, and so forth. In this form it is classified as "rough." Run through a planer, it is known as "surfaced," and dwindles in size by the amount of wood removed. A nominal two-by-

four surfaced on four sides (S4S) thus shrinks to 1%" by 3%" in cross section, a one-by-six board to 25/32" by 5%". A "five quarter" board, nominally 1%" thick, comes to 1 1/16" when dressed

Some lumber can be bought surfaced two sides (S2S) or one side and one edge, and so forth. Rough lumber, if available, is a good choice for some jobs, although hard on the hands. Rough rafters may be okay, for example, while rough studs may cause trouble, since differences in width would make the walls irregular. Dressed or surfaced lumber, on the other hand, is uniform. Planing straightens the pieces and makes the sides and edges parallel. Uniform width or thickness is important when pieces are to form an even surface for further construction. Studs in a wall, for instance, are placed on edge and therefore should be sized across the width on one or both edges. The same is true of floor joists. It's wasteful of time to lay odd widths and then dress them to match.

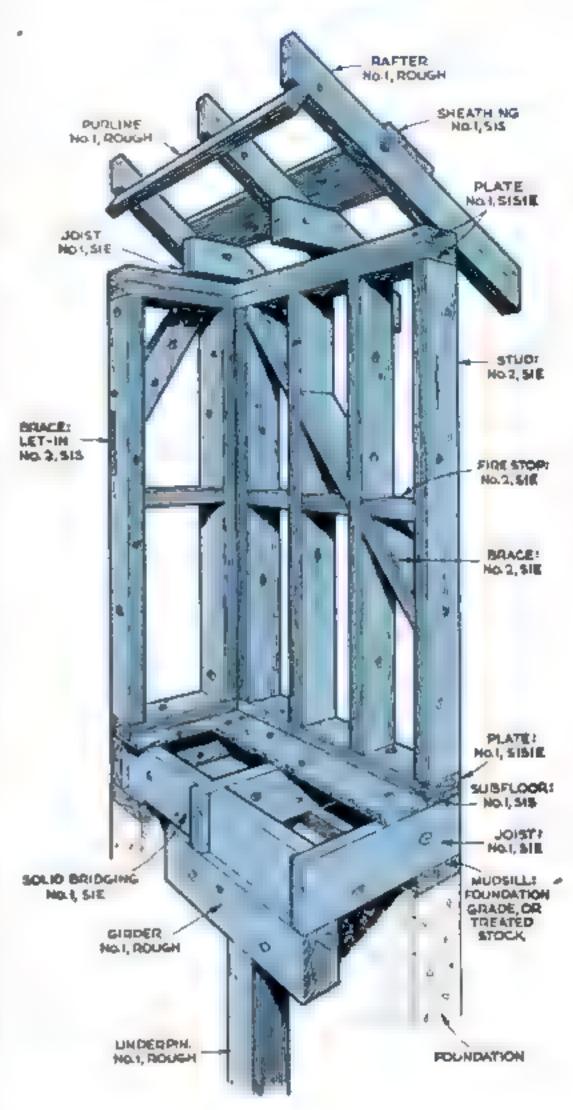
A third classification, "worked" lumber, refers to stock that has been run through a molder or similar machine and made into siding.

casing, bead or molding.

Surfaced, or sized, lumber is grouped in three categories: Yard lumber includes boards and dimension lumber up to 5" thick. Structural timbers are 5" or more. Both groups are graded as to quality with the use of the entire piece in mind, therefore a bad defect downgrades the piece. Factory and shop lumber, on the other hand, is meant to be cut up and permits defects between usable sections. This grouping has special interest for the craftsman (see page 218).

How wood is graded. All but the most expensive lumber has defects. Grading regulates the size and number of these. You should know enough about grading to buy the cheapest lumber suitable for your purposes and also to recognize inferior grades if they are sent to you by mistake. The safety and durability of a garage or house

FRAMING GRADES



typical uses of No. 1 and No. 2 common framing lumber are shown above. In general, members used in a horizontal position are under greater stress and should be No. 1 grade. For vertical members such as stude, No. 2 is adequate. Initials in above drawing refer to dressed members: S1S meaning surfaced one side; S1E, surfaced one edge; S1S1E, surfaced one side and one edge. Accurate sizing assured by surfacing is important where pieces form a base for a flush surface. Wall stude, floor joists are examples.

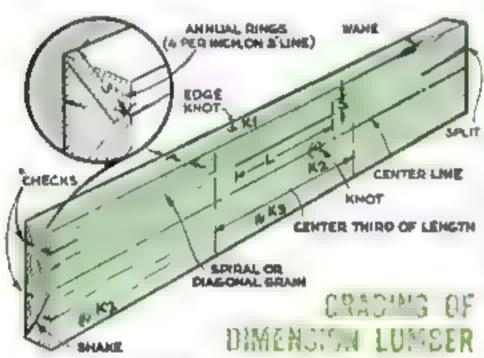


PITCH POCKETS, open seams containing liquid or dried resin, spoil a board as far as they reach when as big as this one. Small pitch pockets are harmless except for their sticky drippings. Decay spots weaken the piece as much as knots the same size.

PLAIN AND QUARTER-SAWN. Top piece was quarter-sawn, cut across the annual rings. Lower one was plain or flat-sawn, cut tangent to the rings. Plain sawing is less wasteful, produces wider boards. Quarter-sawn stock has attractive grain, shrinks and splits less.

addition may depend upon your caution. Where building inspectors check on construction, you may have to rebuild anything in which less than required grades have been used.

In grading framing lumber, strength is the chief criterion. For this reason not only the size of the defects and whether they're



HOW It's GRADED. In framing lumber, the size of permissible defects is a fraction of the width or thickness (W or T). Where they may appear is shown above. Example: in No. I common, K3 may be W/4; that is, face knots near one edge in the center third of the length may be one-fourth the width in diameter. On the center line or at end (K2) knots may be a third the width in size. Edge knots (K1) may be T/3, Spiral or diagonal grain is measured in center of piece as slope (S) in a given length (L)—1 in 10 for No. I common, I in 8 for No. 2.

sound or loose, but also their location is taken into account. A knot near the end of a two-by-four impairs its strength less seriously than one in the middle or near the edge. Therefore larger end knots are allowed. Checks (end cracks) may be only one-fourth the thickness of a piece of No. I common, or if two checks are opposite each other, their total must be no more than one-fourth of the thickness. In No. 2 common this tolerance goes up to one-third. An accompanying diagram shows these grading principles.

Money-saving tips. Besides using the lowest serviceable grade for the job in hand, you can sometimes trade time for a cash saving by picking over cull lumber. Plenty of split and otherwise damaged stock is usable. But it may require extra sawing to square off the ends, and only you can decide whether it pays.

Milling defects sometimes put lumber on the bargain counter. Hit-and-miss surfacing, in which the knives missed low sections, still leaves boards suitable for sheathing and subfloors, for instance. Some price arithmetic will show whether such stuff is worth buying.

Large beams, like those over wide garage doors, can be bought as timbers, but inside defects may be hidden and the pieces are hard to handle. A good alternative is to spike two pieces of 2" stock together side to side. Another lumber-saving dodge, build-

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YOU CAN TELL well-seasoned wood by the curled, silky shavings a plane turns up, which do not choke the throat of the tool. Rapped with the knuckles, dry wood has a clear ring unlike the sound from green stock. Poorly seasoned wood may shrink still further,

ing regulations permitting, is to use two-byfour ceiling joists over halls and for spans of 10' or less.

Weaknesses in rafters and joists that show up after they are in can be corrected by nailing "scabs" of 1" stock on each side of the piece. They should extend about 2' each way beyond the defect. Studs bowed edgewise can be straightened by making a saw cut in the concave edge and expanding it with a wedge, afterward reinforcing the spot with scabs.

It's a good idea to clamp the member against a stiff, straight piece before you nail on the scabs.

Clear stock for porch columns comes high. A stained or natural finish can be satisfactory even if there are a considerable number of firm knots. For a painted finish you can use even rough or knotty pieces. Chisel back the knots, plug the holes with wood held in with waterproof glue, and fill rough spots with a good surfacing putty or fine sawdust mixed with waterproof glue. Sand well all over when the glue has set.

It's good practice to set door and window jambs before plastering, letting them take the place of plaster grounds. If you want the best finish in the least time, use kilndried B and Better, vertical grain. This grade allows only two or three pitch pockets in a 12' length of 8" board, no knots or skips on the face, and no cupping.

If you can pick your own jamb stock and

WHAT WOOD WILL YOU USE?

Coast to coast, our forests offer a variety of useful building lumber. Your dealer will ordinarily stock the kind that grows nearest and therefore costs least to haul to his stacks. It will usually cost you less, too.

Douglas Fir (also known as Oregon Pine) is neither fir nor pine but a species in its own right. It is very strong for its weight, resists soil moisture and decay, takes a good finish, and is made into plywood, doors and trim as well as framing stock.

White Pine (also known as Northern, Eastern and Canadian White Pine) grows from the East Coast to Minnesota and as far south as Georgia. It is much used for millwork as well as framing, is easy to work and less resinous than other pines.

Idaho White Pine (Western White Pine) has characteristically colored small tight knots. Better grades are used for the same purposes as Northern White Pine, while the lower grades are used for construction lumber and knotty-pine paneling.

Ponderosa Pine (California White Pine or Western Yellow Pine) has a number of regional names but is not truly a white pine. It is much used for millwork. If it will be exposed to weather, it should be treated to resist moisture.

Southern Pine (Southern Yellow Pine) takes in loblolly, pond, slash and other pines growing from Virginia to Texas. Some is known commercially as North Carolina Pine. Uses run from structural timber to mokling.

Eastern Hemlock is found as far west as Wisconsin. West Coast Hemlock is often intermixed with Douglas Fir, and can be had in wide sizes of vertical-grain boards.

Redwood is also a West Coast wood, valuable for purposes ranging from ceiling to sheathing. Free from resin, it takes paint well and is resistant to weather and decay.

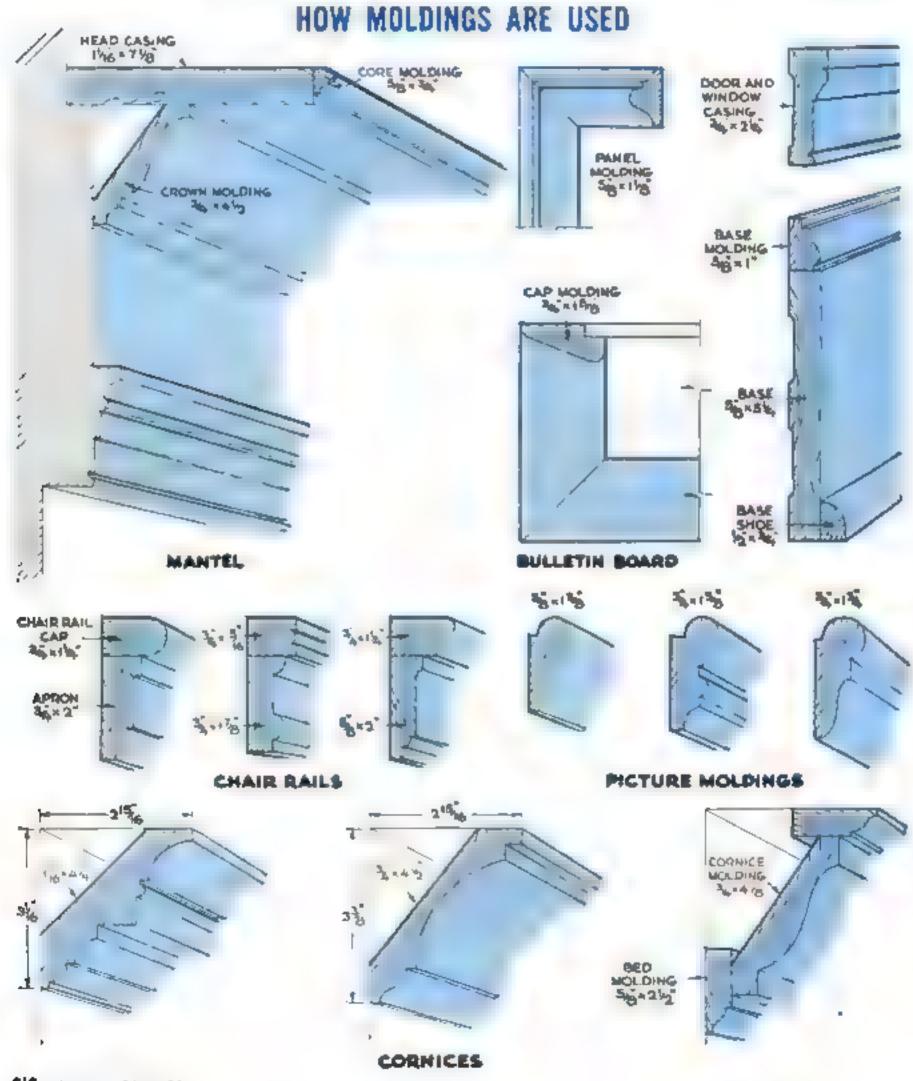
Cedar and Cypress are useful for sheathing, exterior trim, and siding.

W00D...

are sure of getting straight pieces, buy as near finished width as possible. For delivery, sight unseen, better get it wider so that edges can be jointed straight without making the material too narrow. This also applies to "pulley stile," or jambs for double-hung windows already grooved for the parting bead. If this material is bowed edgewise, jointing the edges will still leave the groove curved.

Unless you are certain of getting worked stock that is straight, you'd better buy plain boards and groove it yourself after jointing to width.

Grain appearance is a clue to how well the wood will hold paint. Flat-sawn lumber with wide slashes of hard grain may flake paint off the hard parts. If hard grain appears as threads, it should hold paint well, but the broad hard grain of summer wood makes a board a poor prospect for painting.



Shopping for Plywood

NO CRAFTSMAN should pass up the great advantages of plywood. It's the ideal material for all sorts of projects ranging from outdoor playhouses to furniture,

You can choose plywood for weather resistance, beautiful grain, plain toughness, flexibility or a combination of these. Often it will save you an enormous amount of work by eliminating framing.

The trick of gluing together layers of wood goes back to the ancient Egyptians, who left some nice examples. Yet until recent years veneered furniture carried a stigma because of a tendency to come unstuck or neel in time.

Plastic-resm adhesives and modern plywood presses have laid that ghost. Today's plywood is more resistant to splitting, warping and shrinking than natural wood. Pound for pound, it is stronger than steel.

Core construction. If you look at plywood edges, you'll find two main kinds. Some plywood has a comparatively thick middle layer of solid wood, with a 1/16" layer on each side and the very thin face veneer (1/28" thick) outside. This is lumber-core plywood. It is just the thing for projects like furniture, which call for doveled, splined or dovetail joints.

Fir, pine and some hardwood-veneer plywoods may show three to seven layers of similar thickness on the edge, with the grain of adjacent plies at right angles. This is ceneer-core plywood. It is cheaper but not as desirable where edge joints must be made or where edges will be exposed.

Will it stand scenther? Plywood is manufactured with different kinds of adhesives for various kinds of service. If you are paneling a rumpus room or building a bookcase, the interior or moisture-resistant type is fine. For an outdoor playhouse, sign-board, or other job exposed to weather, you will want the exterior type. This will stand up under permanent exposure without going to pieces. Since it costs more, it is a hixury where exposure is not a factor.

If your fancy runs to boat building, you



By John Rogers

STANDARD PANELS are 4' by 8', but many yards have a stockpile of smaller sizes. Type and grade are marked on panel edges. When you cut one up, mark pieces for identification.



PREGROOVED PLYWOOD combined with louvered doors, wire grilles and scrollwork make this unusual dividing wall. The grooved panels simulate planking, but are easier to install.

WOOD ...

THREE WAYS TO HIDE EDGE GRAIN





BEVEL CLIT PLITS CORE IN

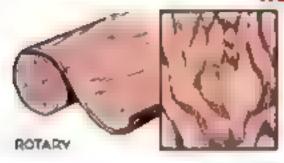


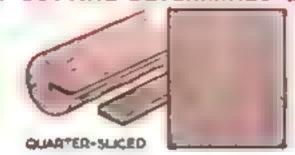
LUMBER CORE

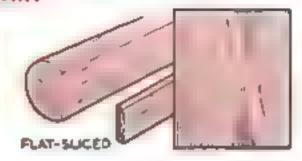
GRAIN OF PLES
AT DISNIT ANGLES

VENEER CORE

HOW CUTTING DETERMINES GRAIN







are in the market for a third type—marine plywood. This can be had in fir, mahogany, birch, spruce and cedar. All three types are clearly identified on the panel edges.

The face woods. Veneers for plywood are cut three different ways. For common fir plywood, it is usually retary cut—sliced off the logs as an apple is peeled. This gives it a wild zigzag grain that is hard to hide or sand out. Other veneers are quarter-sliced or flat-sliced. Each method produces its own characteristic grain. By the last two methods, slices can be pieced together for matched-grain effects.



HARDWOOD-VENEER plywood makes beautiful kitchen cabinets. Doors are self-supporting without framing. Clear lacquer finish leaves the attractive grain fully visible.

Fir plywood, the most economical, comes in a number of grades differing in surface quality and price. The best buy for general utility and for projects in which grain appearance does not matter, it comes in thicknesses from %" to 13 '16". The standard panel is 4' by 8', but many yards have a stockpile of smaller random sizes.

Ponderosa-pine plywood is widely used for interior paneling and furniture making. Its clear white color makes it ideal for natural or color-stain finishes. You can also buy it prefinished.

Hardwood-veneer plywood is available in over 30 woods. The veneers are variously cut to obtain the most beautiful grain possible, and panels with matching grain can be had. Face woods include birch, butternut, bubinga, cherry, elm, gum, barewood, mahogany, oak, teak and many others.

In addition to plain panels, some hardwood veneer plywoods come in checkerboard panels, in prefinished, edge-grooved wall panels, and random-grooved panels.

Plywood grades. All fir-plywood panels are clearly edge-marked with their type and grade. By careful buying you can stretch your shopping dollar. Why cut a cabinet back from the best grade at 20 cents a foot if 12-cent wallboard grade will do?

The quality of the two faces of a panel determines its grade. A "good" face consists of a single sheet of smooth, clear ve-

neer. A "sound" face may consist of two pieces of veneer per panel, perfectly joined but with small imperfections such as patches, stains or sapwood. A "utility" face may have knots, pitch pockets, knotholes and splits (up to 1/16" wide) that impair the looks but not the strength of the panel.

Obviously the best grade has two good sides (designated as G2S). This grade is called for when both sides will show and are to have a finish revealing grain. Where only one side will show, a "good-one-side" panel (G1S) will save you about a nickel a square foot. The other side is sound.

For projects that are going to be painted, the sound-two-sides (\$2\$) grade or even (when only one side will show in the finished job) sound-one-side (\$1\$) will do. Wallboard grade (WB) has a sound face and utility back. Sheathing (\$H) has two utility faces and comes unsanded, in 5/16" to %" thickness. A special grade for concrete forms, made with highly water-resistant glue, can be used again and again. The edges of this %"-thick panel are sealed with paint, and the faces are oiled.

Another marking system designates faces as A, B, C and D. Therefore an A-A panel would have two good faces, one marked A-C a good face and utility back, while sheathing might be marked C-D or D-D.

Occasionally your yard may have reject panels, at savings of two to three cents per square foot. Some will be sanded, others not, and the defects for which they are rejected will vary greatly. Unless you can pick them out yourself, they may not be a good buy. Photos on the following page show how, with some extra work, you can save money by using the lower-grade panels.

Special surfaces. Striking effects are achieved by texturing the surfaces of plywood panels. A series of machine-cut grooves all over the face, for example, produces a novel striated effect. Besides concealing the wild grain, this also disguises butt joints between panels so that no molding is required over them. Striated plywood is popular for interior wall paneling, and cheaper than hardwood veneers. It can be finished natural, stained, or painted.

Strated plywood is also made for siding. This is a three-ply exterior type **" thick, precut 15%" long and 48" wide. It is somewhat cheaper than standard siding and faster to install.

Another surface treatment is produced by wire-brushing, which cuts down the Hardboards are first cousins to plywood. Made of wood fibers, these tough, smooth sheets have many advantages all their own. An article in next month's issue will tell all about them.

soft parts of the grain faster than the hard, leaving these in rehef. This kind comes in regular, 4' by 8' panels and also in panels grooved to simulate planking

Finishing plywood. Rotary-cut fir plywood is notorious for its wild grain. A good sealer such as Rez or Firzite will make finishing easier. Lacquer or wax may be used for a quick, durable one-treatment finish. Color stains produce striking modern effects. Stricted and wire-brushed surfaces respond well to two-color treatment.



TEXTURE TREATMENTS either emphasize face grain or disguise it. Weldtex (top) is fir plywood, machine-grooved to produce a striated panel, Malarkey Shadowood (center) is available in both clear and knotty redwood with the soft grain wire-brushed down. Wedge-Wood (bottom) has a rotary-cut hemlock face treated to give a sculptured effect.

Don't let cost scare you away from plywood. Here's how to use the cheaper grades.

Plywood for Less Money

By Paul Corey

IF the going rate for standard "sound-two-sides" or "good-one-side" plywood panels has you stopped, consider what you can do with muscle instead of money. The cheaper grades of fir plywood are not sold for interior fluish, but you can use them by putting in some extra work. You can then bank the difference.

Occasionally a lumberyard will have a stock of "reject" panels. These may have excessive aplits, open knotholes, or patches.

Again, they may be almost indistinguishable from better grades. Sometimes they are sanded, sometimes not.

Even if your yard has no rejects, it certainly carries sheathing grade. This comes in three-ply panels 5/16" and 3" thick, and m five-ply panels %" and %" thick. Neither face is sanded, but it costs little more than half the price of the top grade.

Examine the panels carefully to make sure you're putting their best faces forward. Then use one of the tricks shown in these photos to suit your plans and pocketbook.

FOUR WAYS TO LICK THE ROUGH GRAIN OF CHEAP PLYWOOD



PLEASING FINISH is obtained on pieces without serious surface defects by Just applying paint. Brush on two coates sand lightly between.



the grain nicely, but is feasible only on small areas. I se a flexible cable or electric drill, Brush with grain.

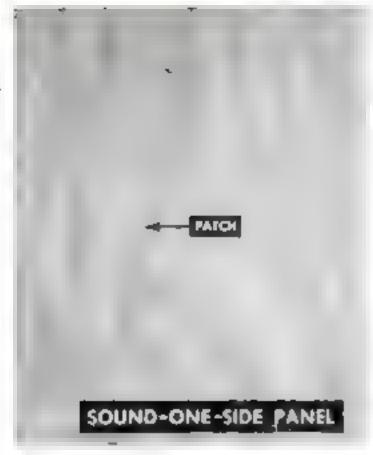


UNOLEUM is a good covering for rough plywood used as a desk or counter top. Fill and sand big cracks before spreading impleum paste.

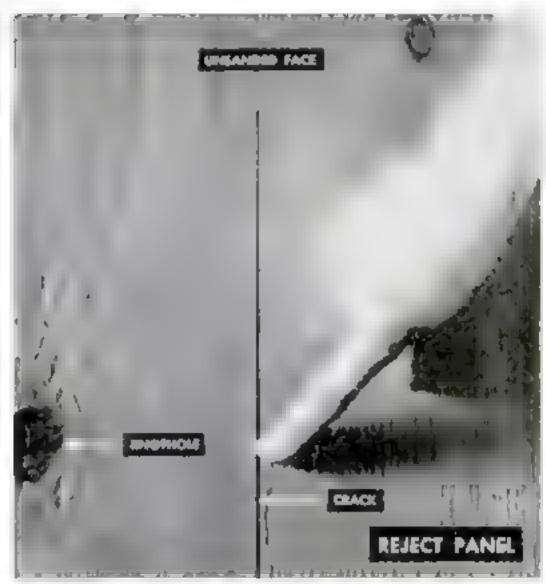


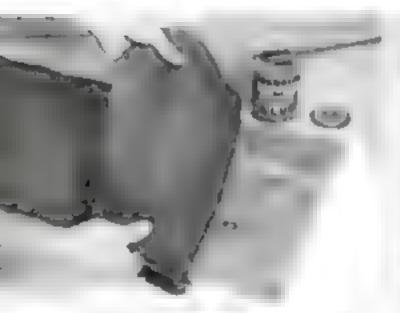
WOOD-PUTTY type of filler will level off plywood surface and make a good paint job possible, First wet the wood thoroughly with a

brush (left above). Make a thick mix of the filler and spread it with a wide putty knife (center), Smooth with power sander.

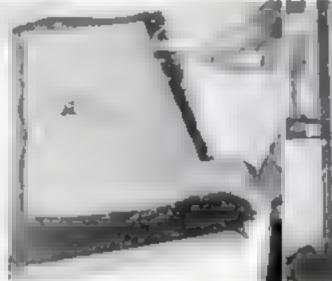


THE DIFFERENCE between a sound and a reject panel may be as great as that shown here. Note patch in sound face above. Defects at right are worst you'll find, For painting, they can be puttied or plastered.





BURLAP FACING can transform cheap plywood into good-looking doors. Fill worst cracks, then spread glue evenly, apply burlap.



TVRN OVER and drop burlapcovered panel into rabbeted frame as above. Be suce burlap is pulled smooth. Null in place and trim excess cloth.



FINISHED DOOR is light, nonwarping and altractive. Other cloths and patterned material might be used. Glue should be nonstaining kind.



PLASTER-BASE CRACK FILLER such as Spackle can be used to get a smooth painting surface. First give the panel a priming coat of paint

(left). Smooth on the filler with a putty knife as evenly as possible (center). After it has set, sand the surface smooth.

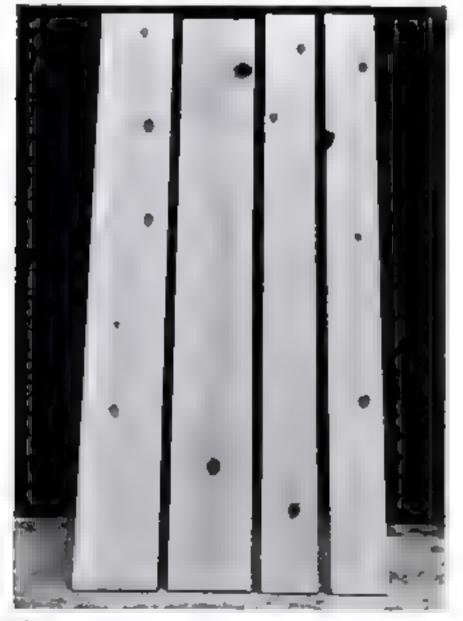


You don't always have to spend
money on wood for small projects
—and what you must pay for
will be cheaper if you use shop grade.

Low-Cost Wood for Craftwork



APPLE-BOX WOOD was raw material for the projects directly above. Saw out the knots from shop-grade lumber (below) and the pieces left will be clear grade, at half price.



218 POPULAR SCIENCE



By D. Aller

WOODWORKING hobbyists waste thousands of dollars every year cutting up expensive lumber into little pieces. Nine times out of ten the fellow who turns bowls or lamps, carves plaques, or builds knickknack shelves brings home clear stock of finish grade—the most expensive he can buy. Yet he could get wood just as good for his purpose at about half the price.

Ask for shop grade. The secret of saving money is to buy factory- and shop-grade lumber. If the nearest yard doesn't carry this, it will pay to find one that does.

Shop-grade lumber is none too pretty at first glance. It has plenty of knots, many of them along the edges, and some holes where loose knots fell out. Your first reaction may be to wonder how you can use it.

But this material is a gold mine to the craftsman, especially if he has a power saw. By cutting around the defects, he winds up with a lot of pieces just as good as the finish grades that cost so much when bought as boards. For many projects—lamps, book ends, corner shelves and candlesticks, only small pieces are needed.

Shop-grade lumber is a good bet, too, for

the man who does weekend carpentering around the house. He will need more ingenuity to use the odd-sized pieces for shelves, racks, vegetable bins and so forth, but the saving makes it worthwhile.

Use those boxes. Don't overlook the lowly apple box and packing crate as wood sources. The ends are often %"-thick soft pine, which is suitable for many small projects. Crates are sometimes made of hardwood in the poorer grades, but between the splits and knots you may find short pieces of usable craft wood.

The thin sides of fruit boxes are ideal for such small items as birdhouses, space shelves, spoon holders and other colonial

reproductions.

When you want hardwood. You may find wonderful hardwood in your own or a neighbor's attic. Old pieces of furniture—bed headboards, chests, and especially old extension-table leaves—are good sources.

The only drawback to using such material is the old finish, which usually has to be removed. Don't make the mistake of trying to sand it off on your disk or belt sander—it will clog the abrasive cloth rapidly. Coarse, open-grained paper of the kind used on floor sanders is better. But the safest way to strip the wood is with paint remover and a scraper.

Try your yard, but . . . Scraps of new hardwood are sometimes obtainable as mill ends. Look for a lumberyard that does mill-work. Sometimes you may need stock of less than standard thickness, which is hard to come by as a regular thing. The mill may have leftovers of x" or x" thickness

from large milling orders.

But let's face it: the chances are that your local lumberyard will carry chiefly the softwoods commonly used for construction work. That means that if you're bound to use hardwoods you may have to forget about a low-cost job. The lumber dealer may be able to order any special hardwoods you want. Or you can order them yourself from one of the mail-order houses specializing in craft woods.

Among these wood specialists are Albert Constantine and Son, Inc., 797 East 135th St., New York 54; Craftsman Wood Service Co., 2727 S. Mary St., Chicago; and Frank Paxton Lumber Co., First and Kansas Ave.,

Kansas City 3, Kansas.

Wood from such sources will be perfect, every piece selected and usable to its full size. Naturally, it also costs more.



CASH AND CARRY will save you money at most lumberyards. A car-top carrier makes it easy to take your purchase home. Shopping in person also gives you your pick of the stacks.



Mill ENDS, manufacturing scraps, lumberyard shorts and even waste from building jobs can yield valuable material. This trailer load could keep a craftsman happy for months.

THERE'S GOOD WOOD in fruit crates and boxes. The rough sides can be sanded to yield 3/16" to 5/16" stock. To avoid splits, hammer against piece of wood as shown below.



WOOD...

Even the experts can't pick them
every time, but these clues will help
you recognize the more common kinds.

How to Identify Woods

WHEN you order birch or maple from a craft-woods dealer, you get what you ask for. But there's a trick to it: the dealer keeps each kind in a separate stack. Once let them get mixed, and even the experts couldn't put them all back just right.

Nature never quite duplicates anything, and wood being a natural product, no two pieces are ever exactly alike. Although one may unmistakably be maple, you can look farther and find a piece of maple anybody

might take for birch. Furthermore, there are varieties even within a kind-nine, for example, of white oak. So don't underrate yourself if you aren't sure which is which.

The photos below show typical examples of eight common woods, and the captions give clues to help you tell one from another. But grain, color and even hardness may vary widely. If you keep a mixed stack, the surest way to tell the kinds apart is to mark each piece the day you get it.



LIGHT in color and weight, most pines range from off-white to light tan, sometimes with an orange east, and weigh less than 2½ lb. a board foot (kiln-dried). Southern yellow pine is definitely brownish yellow.

FAIRLY LIGHT in color, burch has a yellowish whate sapwood with a reddish brown heartwood. It is a close-grained wood, hard and reasonably heavy, weighing approximately 3½ lb, per board foot when kiln-dried.





the color. Mahogany is a medicum reddish brown, similar to finished cedar and much lighter than finished mahogany furniture. It has open pores, and is fairly heavy.

POPLAR, often called whitewood, has the lightest color of the eight woods shown here. The sapwood is almost white, but the heartwood is pale olive to yellow brown. It is moderately soft and lightweight.





CHERRY FURNITURE is often deep red, but the wood is actually a light reddish brown—about as dark as white oak—with perhaps a green cast. It is close-grained, fairly hard and heavy. "Fruit wood" is usually cherry.

called hard, lives up to its name—it is hard and heavy. The color is a light tan, lighter than pine but darker than poplar. It has very fine texture and grain, weighs about 3½ lb. per board foot,





THE OPEN GRAIN is the best tip-off to the oaks. White oak ranges from light tan to light brown in rolor; red oak is reddish or light reddish brown. Wood from the oak trees is extremely hard and heavy.

very park, walnut is a chocolate-brown color, often with a purplish cast. It has open pores and is moderately dense and hard. The texture is fine and even. The kiln-dried wood weighs about 3½ lb. per board foot.



Oven shelf. Cut in half and fitted with a wire handle twisted around the frame, it becomes a broiler to hold a big T-bone steak over an open fire.



Tear That Old Range to Pieces...

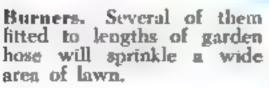
It has many parts that you can put to good use. Here's at least one suggestion for every part in the stove.



Grill. Set up on stones, it supports the coffee 'n beans for that outdoor barbecue.



Gas cocks and burner tray.
Gas cocks make valves for your compressed-air outit or for dribbling coolant on power tools. Set the tray under the tools to catch chips and drippings.



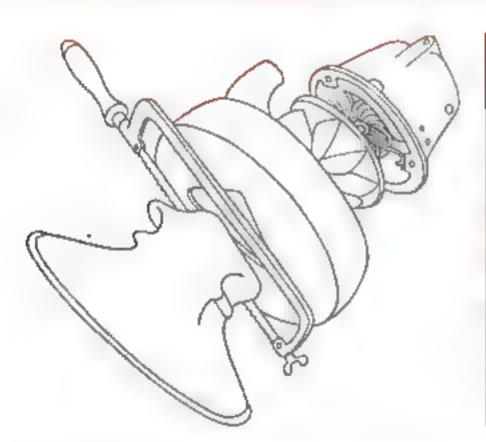


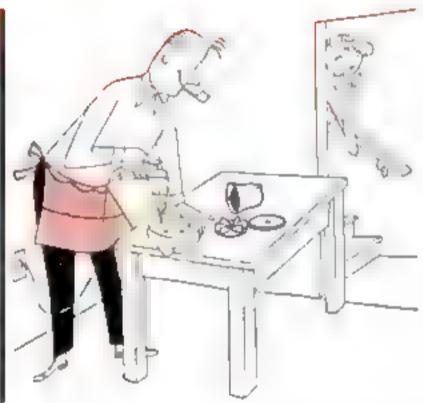
Legs. They're made of heavygauge steel and make sturdy legs for a workbench.



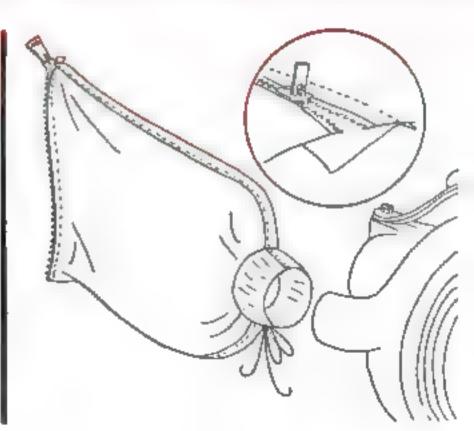
Workshop

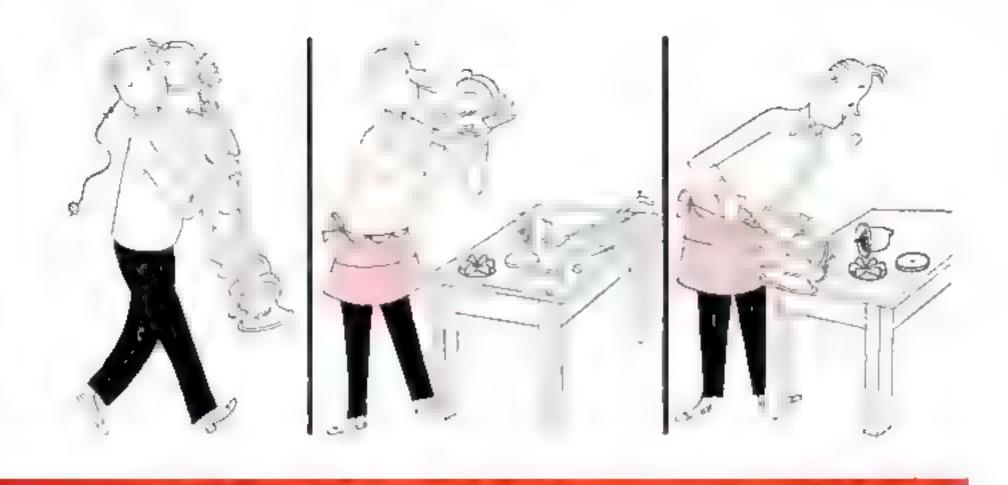


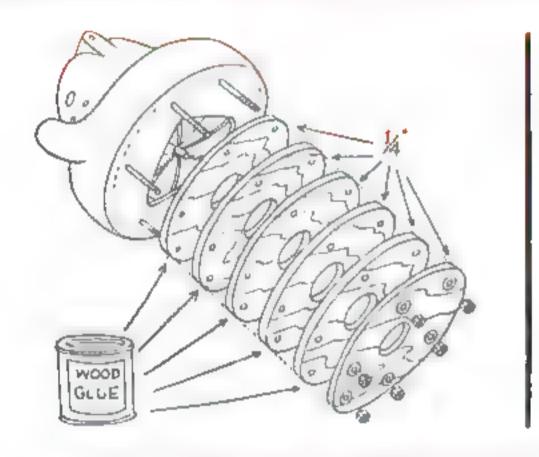


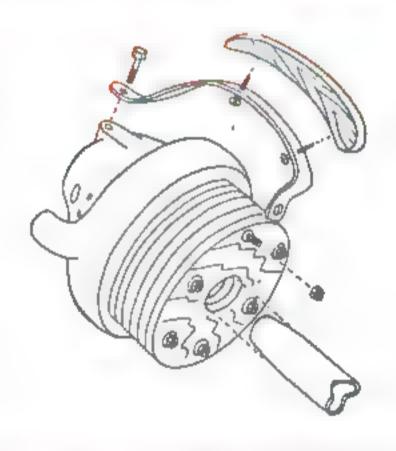














See PSM next month for another Wordless Workshop. SEPTEMBER 1953 223



MODEL PARTS such as boat propellers or toy wheels can be east in home foundry.



FISHING SINKERS. Eyes bent from bruss wire are placed in mold before pouring lead.



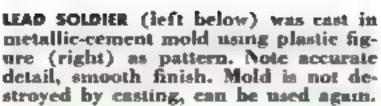
STEAK KNIVES, Handles are east around stainless-steel blanks, Blank is at right.



EMBLEMS, bruternal crests, name plates or tropity decorations are good casting subjects.

JEWELRY by the handful can be east of solid solver, and then buffed sparkling bright.







Iron-Paste Molds Make Casting Easy

Using this method, you can turn out small metal objects with production-line speed.

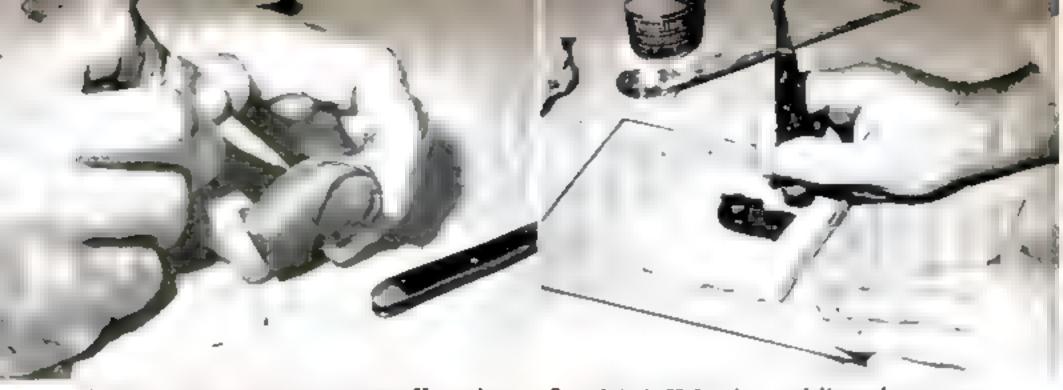
By John Burroughs

INTRICATE, odd-shaped parts that you can't build up from stock metal can be east in tough molds made of ordinary powdered-iron cement. Using the cement instead of the old sand method gives you a strong, durable mold that will last through dozens of eastings. It produces a clean, smooth surface that's finer than many foundry sands, saving hours of finishing

You can buy the metalic cement at any hardware store. Mixed with water to make a heavy, slow-flowing paste, it is simply poured over patterns that are flat on one side and allowed to set. Patterns with details on both sides require a mold made in two sections so that you can get the finished casting out. One half of the pattern is embedded in modeling clay while the first half of the mold is made. Only other materials you'll need are some petroleum jelly for greasing the mold, a crucible and suitable source of heat for melting the metal and a supply of scraps to melt down. The pattern can be almost anything made of wood, metal, plastic or wax. Even a soap carving will do if it's waterproofed with a coat of shellac

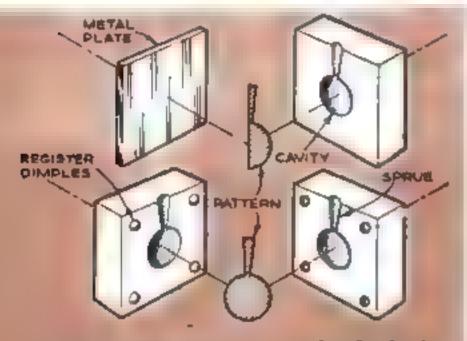
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POPULAR SCIENCE



1 THE PATTERN MAKES THE MOLD. Here chess figure is divided with pencil line into two halves for easy removal from mold. This is called the pacting line.

2 PRESS PATTERN in modeling clay up to parting line for first half. Press register dimples in corners and build up clay puttern for the sprue (built-in pouring spout).



TYPICAL MOIDS. One at top is for flat-back patterns—wall plaques, emblems, some costume jewelry. Only one half and a flat plate are needed. Hottom mold is for figures that have details front and back. Two halves are needed, I ndercuts or sharp inside corners to pattern must be filled so easting will lift out of mold easily. Where possible, file a slight taper on pattern.

J POUR MIXED IRON CEMENT over pattern in clay after greasing it and framing it with sheet metal. Pour beside a running power tool or tap bench to vibrate mix and settle it around pattern. This completes half of mold.

4 SCRAPE OFF CLAY when mix dries and check pattern for easy removal from mold. Put pattern back in mold, grease entire surface and pour second half of mold against the first.

5 SIPARATE THE TWO HALVES with knife blade at parting line and lift out pattern. Requister dimples in first half form matching projections in second half. (Please turn page.)





6 PATCH IMPERFECTIONS or bubble holes, if any, with a thick mixture of iron cement and set the mold aside for several days to harden and thoroughly dry out.

7 PREHEAT MOLD to drive out last trace of moisture and keep metal from chilling too fast. Slightest dampness will cause metal to splatter, so keep your distance when pouring.



O CLAMP GREASED HALVES TOGETHER and heat O casting metal in crucible. Sprinkle molten nictal with welding flux or borax and pour into mold until it is filled to top. Let it cool.

PINISHED PRODUCT OF HOME FOUNDRY, Unelamp and pry mold apart to remove casting. Gip off sprue, remove flash and buff beight. Sanding disk amouths flat surfaces.

| C 10 | 120 | TI | M | |
|------|-----|-----|----|---|
| - | | 6.1 | u. | u |
| | | | | |

| Metal | Melvina
Point | Heat Saurce | Action on Cooling | Sources of Material |
|-----------------------------------|------------------|--------------------------------------|-------------------|---|
| Tin | 450°F. | Gaa stove | Steinlo slightly | Hefrigerator cods,
beer-tap tobase |
| Lead | 621'F | Gas stove | Shrinks | Plumber's lead, scrap
sheeting, drampipe |
| Type metal
(lead and antimens) | 850°F | Gas stove | Expands slightly | Printer's imotype slags,
stereo plates |
| Zinc alloy
(zinc and aluminum) | 850°F | House furnace or
fireback furnace | Expands slightly | Scrandie castings auto
fuel pumps, grillet |
| Magnesium | 1,200'F. | Purnace | Shrinks slightly | Pig |
| Aluminum | 1 216°F. | Furnset | Shrinks | Scrap theet, auto
pistons, cylunder heads |
| Silver | 1,760'F. | Acetylene torch | Shrinks | Jewejer's supply house |
| Brass
(copper and zine) | 1,900°F. | Acetylene torch | Shrinks | Lathe turnings, rod
ends, pig |

FOR YOUR POPULAR SCIENCE MONTHLY INFORMATION FILE





1. Square Blade Cuts Faster. This square blade for circular saws is said to cut faster with less friction because of the smaller blade area in contact with the wood. Requiring less power, it will do heavy cutting normally beyond a saw's capacity. The blade will rip or crosscut and comes in sizes from 5%" to 16".

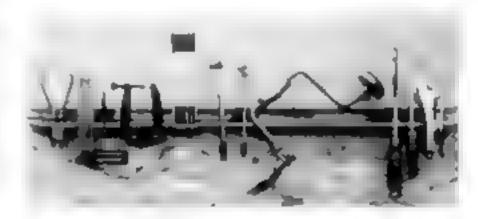
2. Magnets Hold Heavy Tools, Large hand tools are easily held by this heavytluty magnetic rack. The rack consists of two long permanent bar magnets, with the poles arranged on the sides instead of ends so that their holding power is distributed throughout their entire length. Two sizes are available, 24" and 36" long.

3. Hacksaw Cuts Anywhere, Because there's no frame to get in the way, you can



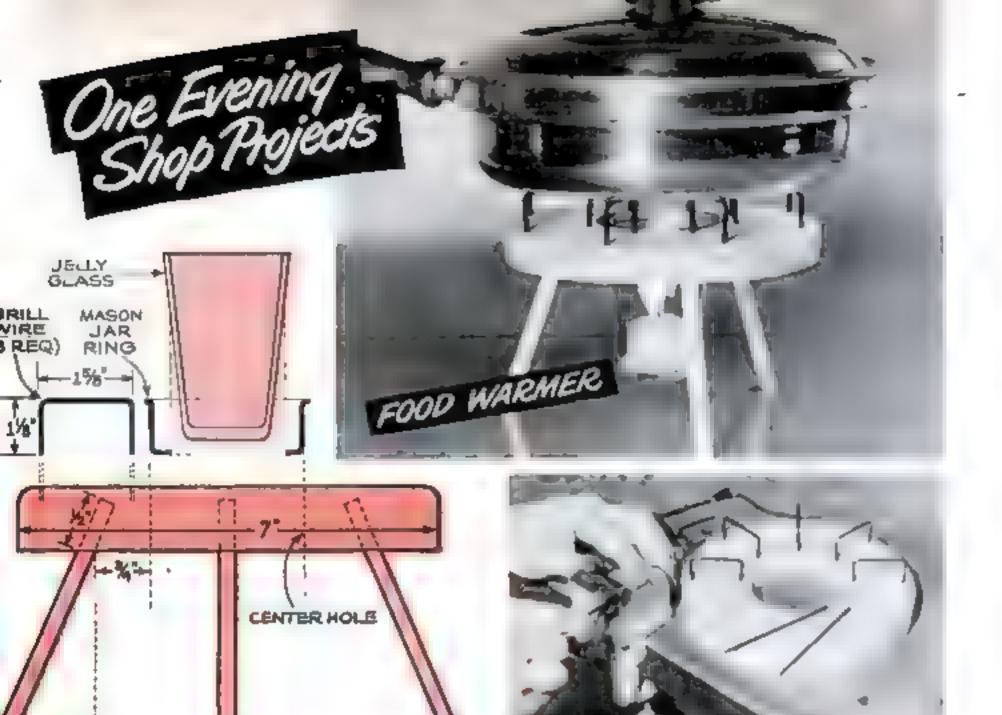
make cuts of any length or contour with this new hacksaw. The blade slides in a grooved guide that rests against the work. After each forward stroke, the spring-held pistol grip draws the blade back, doing half the work for you. The saw will take any standard hacksaw or keyhole blade.

Further information on these products can be obtained from: l. Clark & Sauver, Inc., 600 Vateo St., Los Angeles; 2. Mount Magnet Co., 3240 N.W. 27th Ave., Mount; 3. American Mercan tile Go., 35 W. 42nd St., NYG; 6, Minnesota Mining and M/g.





4. File Dispenses Own Abrasive. As you wear down this file, you simply pull out a new length of abrasive cloth from the roll in the handle. This eliminates the clogging, cleaning and dulling of ordinary files and permits one tool to use a wide range of grit sizes. Each roll holds 6' and comes in grits from 24 to 320.

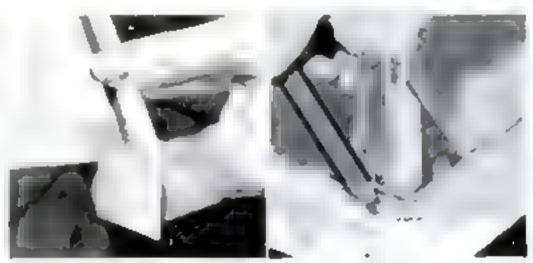


Autumn suppers outdoors stay piping hot with a warmer like this. If you're a scrap saver, it easts nothing.

The top is \(\frac{\pi}{2} \) pine. Bore a center hole with an expansive bit to accept a metal mason-jar ring. After pigsawing it into a circle, drill holes for the angled legs (a jig helps). Before gluing in the dowel legs, drill holes just

big enough for the coat-hanger-wire grill pieces, which you can bend in a small vise (above). A tapered jelly glass fits into the mason-jar ring to hold an ordinary candle. There's no danger of scorehing the wood frame, but make sure the bottom of the glass is at least 1%" above the table top.—Sylvester J. Zuk, Chicago.





If your old card table is on its last legs, here's one you can turn out after dinner. The top, a 27" square of %" plywood, fits into a %" rabbet in 1%" by 2"-by-29%" sidepieces (left above). Nail and glue sidepieces to the top, with corrugated fasteners at the mitered ends (right above). Legs—1"-by-14" clear pine long enough to make the table 26" high—are fastened to the sidepieces with folding hardware—Bill Cartieright, Pittsford, N. Y

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Books stay neatly in place because of the slight tilt of this modern holder. It was made from a few scraps of %" pine plywood, joined with nails and glue. Clear lacquer gives the one above a rich natural finish.—John Rogers, Dallas

A piece of linoleum about 14" by 17%", a tin funnel, a coffee can and some copper wire are the makin's for the big ash-catcher that most dens and shops need. The linoleum is formed into the upright cylinder by wrapping it around the can and securing the overlap with metal paper fasteners inserted in punched holes. The coffee can, which catches the butts, just sits on the floor inside the cylinder. The cigarette rests are made by bending 10" lengths of wire double and shaping the doubled wire around a broom handle. To support them, the ends are stuck through holes punched in the funnel with a bail. The linoleum is disguised with white paint, the funnel enameled black.—Ray L. England, Columbia, Mo.





Rope offers an easy way to make a neat sign identifying your house. Lae letters are shaped from X" line—doubled for some parts

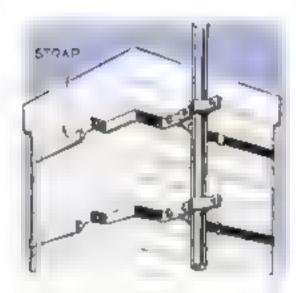
—and fastened to a rough board with brass escutcheon nails. Use %" rope for the border, and bind cut ends.

Windproofing Your TV Antenna

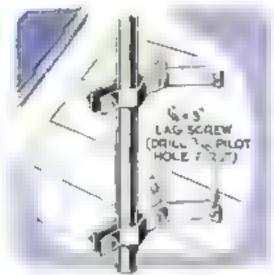
A strong wind can turn your shiny aerial into a mess of scrap—and take part of your house along with it.

Make sure yours is up to stay.

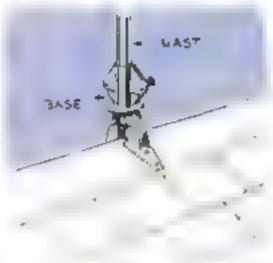




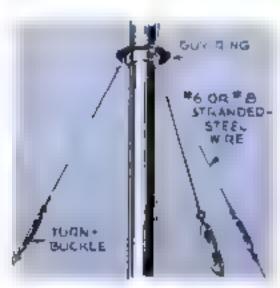
Base of must must be firmly anchored or it may pull away even though top is gayed tight. If antenna mounts on chinney, make sure masonry is sound—weakened chinneys have been torn away right along with mast.



If antenna is mounted on house, use stand-off brackets and lagserew into studs. Studs are found at corners and beside vents, windows in masonry, bore holes with star drill, then insert expansion plugs for screws.



A rooftop mount anchors must to peak where chimney is not present or can't be used. Mount is lagscrewed hanly into indepole of house, but requires guy wires on even short musts as it gives little lateral support.



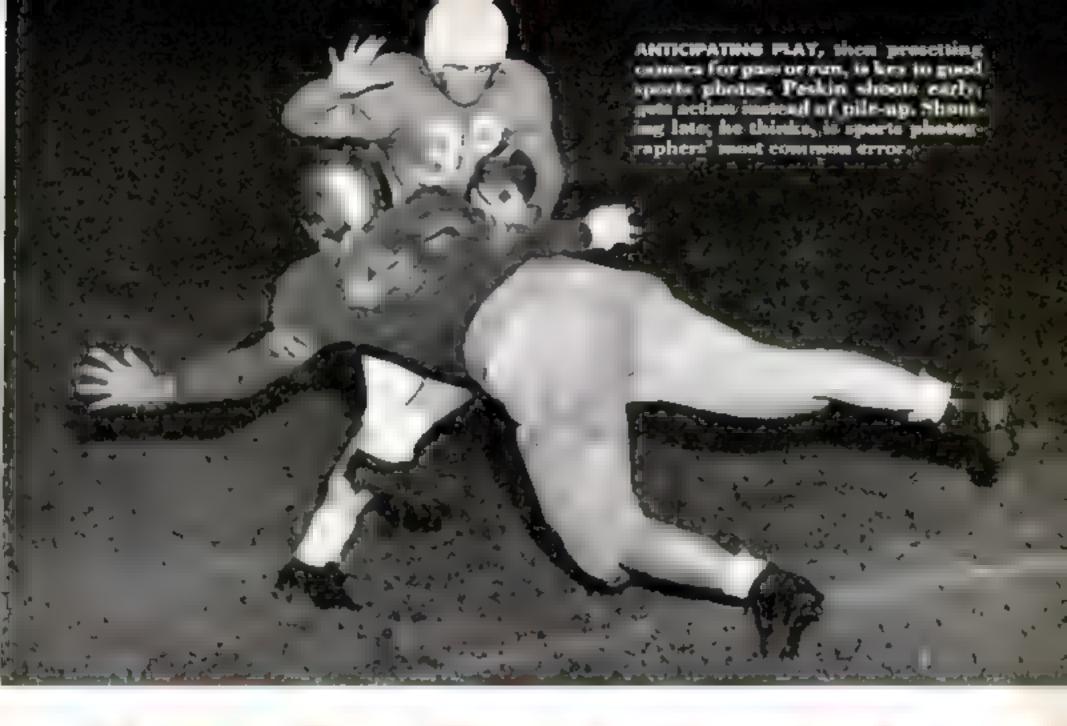
Guy wires keep mast from bending. Attach wires to ring anchor near top and tighten with turnbuckles until just taut—overtightening may buckle mast. Use three or four guys for masts up to 15', six up to 25'.



Tall antennas, 25' or over, should have two sets of guys, one at middle and one at top, to distribute strain. Aluminum tubing, suitable for low masts, should be replaced with stronger steel tubing for high masts.



Anchor guy wires to caves or side of house, not to roof where leaks might occur. Use screw eyes for light masts, rings on screw plates for heavy ones. On masonry, screw rings into expansion plugs set in holes.



How a Pro Shoots Football

Tips from a top sports photographer will help you catch the big game's thrills in your own pictures.

By Dave Stanley

SEPTEMBER busts out all over the U.S.A. with football fever: practicing cheerleaders, pessimistic coaches, optimistic alumni, wild Rose Bowl forecasts—and Hv Peskin

Wiry, boyish-faced, 37-year-old Peskin is one of the country's hottest sports photographers. He has shot more than a thousand picture stories for newspapers and magazines during the last 15 years, everything from hot-rod contests to rodeos. But football is his passion. From now through December

OFF-FIELD ACTIVITY is often as dramatic as play. Here Peskin ratches reaction of bench at tense moment. Grandstand amateurs can adapt technique by presetting camera for eight feet and shooting into crowd.

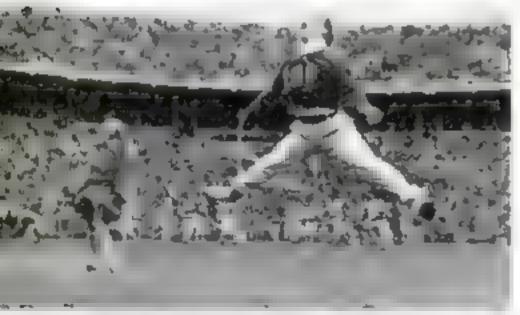


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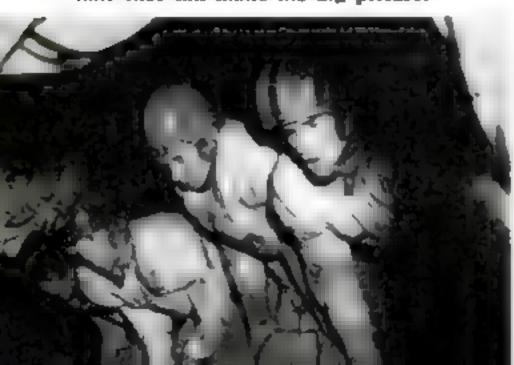
GOOD ACTION SHOT lets you pick out individual elements—runner, blocker, defense instead of jumbled mass of players. Action is

sko heightened by "frame," the stadium backdrop. Sideline shooting is rough on clothes, so wear your oldest duds.



OFF-THE-GROUND ACTION makes best sports shots, believes Peskin, is also effective for sideline color, as above. When shooting cheer-leaders and hand formations from sidelines, kneel, so as not to block spectators' view.

DON'T LET DARKNESS or had weather stop you. As light fails or rain sets in, open lens wider, even shoot a little slower, but don't quit. Often it's the last couple of plays in each half that can make the big picture.



his "studio" will be the big gridirons from Yankee Stadium to the Cotton Bowl, His job isn't easy. He doesn't have the slightest notion what will happen, or where. He can't go back the next day and shoot again. He can't control the lighting. Yet he'll bring back thrilling action pictures every time. Small wonder that leading magazines pay him about \$25,000 a year to cover major sports events for them,

You've Got to Anticipate

The secret? "Anticipation." Peskin says. "That's the heart of action photography because in sports a split second is an eternity. You've got to visualize what will happen and be ready to shoot a half moment before the peak of the action."

Sports photographers usually shoot from two places: the top of the press box up in the stands, and the sidelines. "With a long range camera from the upper press box," explains Peskin, "you're cozy, you're on top of the action with a flick of the camera. You can have your hot coffee and pictures, too"

It's tougher on the sidelines, but that is where many of the best football photos are made. Peskin illustrates his technique this way: "Suppose you're trying to get a picture of a star pass receiver. It's very difficult to follow him down the field and keep him in

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Phosographed for Life by Ha Peskin Time, Inc

CANDID SHOTS taken in locker rooms or at practice sessions make fine pictures, may also get you a pass to shoot at regular games. Show your best ones to local school coach, and usually he'll say okay,



focus with a camera when you have to look down into a box. It's best to use a camera with a sports finder. That way you can follow the action both visually and physically and still see what's coming in and out of the picture." Some of his most effective shots are made from the sidelines, but with his back to the game—dramatic reactions of the crowd or the players on the bench.

Ha Arrives Well-Heeled

When Peskin travels 1.000 to 3 000 miles to cover a single afternoon of football, he arrives like a portable photographic store. His arsenal includes.

■ Big Bertha, the long-range press-box standby, which weighs nearly 50 lb., costs \$1,000 and has 28", 40" and 60" lenses

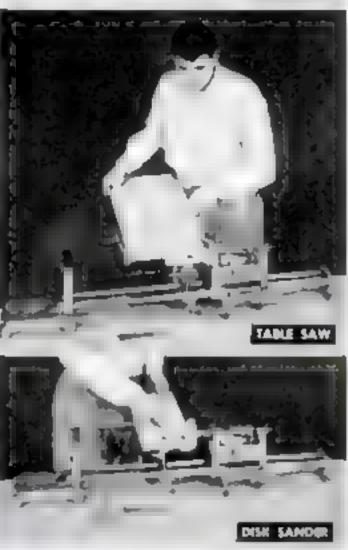
- A Speed Graphic with a 10" lens for sideline shooting
- A Rolleiflex, also for sideline shooting.
- A Leica, for candid shots in the locker room without flash

He uses high-speed film for black-andwhite, Ektachrome for color. "I don't do my own processing," he says. "If I didn't get a picture, no amount of super-duper developing or printing is going to change anything."

Peskin has come a long way from his \$12-a-week start as hypo boy on the New York Daily Mirror. He now has with his wife and two athletic young sons in a comfortable house on Long Island Sound. Hobbies? Photography. The famous sports cameraman can't even swim.





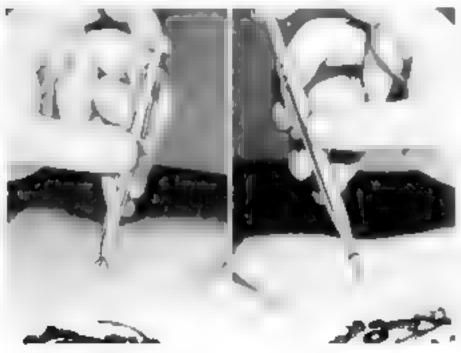


Electric Drill Does Job of Seven Tools

With this combination of accessory stand and electric drill you can perform operations that normally require seven different power tools. A flip of a lever locks the drill securely in the head of the stand. The outfit can be set up as a lathe, bench saw, vertical drill press, horizontal drill press, disk sander

or router-shaper—and the drill can be used separately. A µgsaw is also available for the stand.

The Do-It Shop is portable enough to be used anywhere—even on the kitchen table. Cummins-Chicago Corp., 4740 N. Ravens-wood, Chicago.



Three-Fingered Tweezer Grips Small Objects

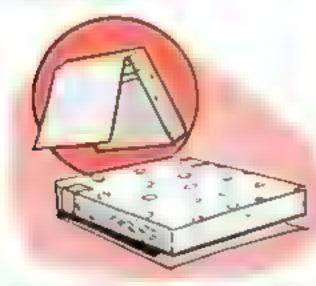
Depressing the plunger on this tool causes three spring-steel fingers to extend and flare outward to grip small objects. Releasing the plunger causes the fingers to retract and hold the object securely. Small parts that are hot, polished or sterile can be conveniently handled with the tool. It's the size of a pencil and has a clip for your pocket. Win Sales Co., P.O. Box 257, Forest Hills, N. Y.

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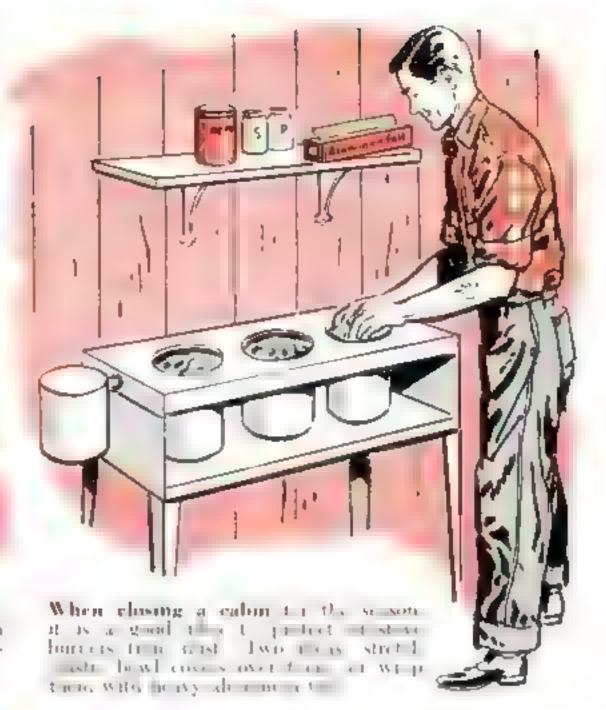
KEEPING THE

Home

SHIPSHAPE



to get a better grip on s. Ipa ar tipe to the same to see of a source of a street to a rebte When sanding, user beger psaidle exposed holes







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PICK YOUR PURPOSE. You may find use for this as a coffee, luncheon or lamp table, a half or occasional piece. Top shown is walnut. White maple, oak or birch with a color-trimmed edge is an alternative scheme.





FRAME PIVOTS ON RIVETS. Wide offsets bent in one rail and stretcher accommodate the thickness of the other one. Single rivet joining each pair to left free enough to turn. Counterwink un-

deraide of top for rivet head.

You don't have to be a welder to turn out handsome furniture like this. Just bend the parts, bang them together with a hemmer and rivets.

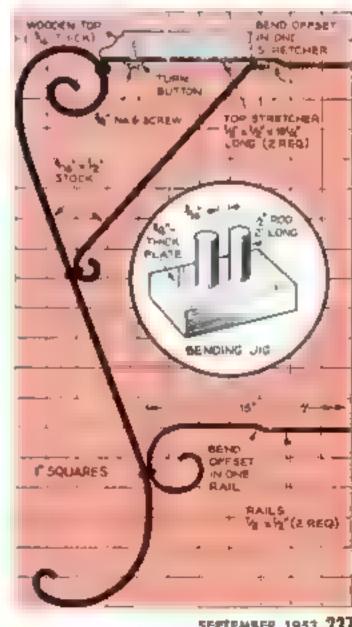
ABOUT 20' of strap iron, a fistful of rivets, A and a wooden top can easily be parlayed into this handsome wrought-from table. Almost any homemaker will find several uses for it.

The stretchers and rails can be made of lighter material than the legs, or you can use 3/16"-by-5" stock throughout. This can be shaped cold in a bending jig made as shown in the drawing. Insert the stock between the rods just enough to get a bite, and bend it around either rod. For large-radius curves, bend only a little, take a new bite, and bend further. Check your bends against a full-size pattern laid out from the squared drawing.

Mark off the rivet holes carefully to insure correct assembly. Two legs-and their crossmembers can be put together as a unit. But he sure to leave one end of the rail and stretcher of the second unit unriveted until the two are put together.

The top can be either round or octagonal. The solid-walnut top shown was given a shaped edge and a dull varoish finish.

For easy folding, four clips or turn buttons are screwed under the top so they may be rotated to engage the stretchers. Or you can screw the top directly on, for a rigid table. I. Sowers, Miami, Fla.



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deas ldeas

Oil Drip Feeder. Once it is set up on the back end of the cross slide, this gravity-feed cutting-oil tank will move with the cutting tool and keep it and the work bathed in coolant or cutting oil. The tank, an old oil filter case, swivels freely on a combination of two unions and an elbow connected by X" pipe. The unions are tightened to lock the tank. A h" pipe flange, used as a base, is screwed to the cross-slide cover. The gascock drip feeder can be adjusted for light or heavy flow.-Joseph Tracy, New York City.





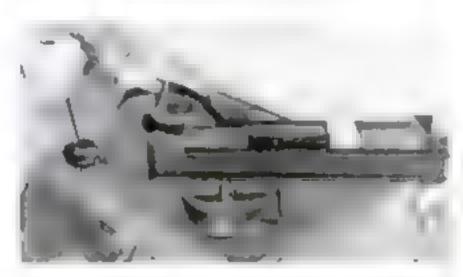
Tin-Can Gauge Measures Radius. Tin cans come in many sizes. Save an assortment and nest them as shown, marking each with its size. Use them to find the radius of an inside or outside corner. They are also useful for rounding the corner where two board edges or lines meet at right angles; just push the can up to the edges and draw in the radius.—George Kapitan, New York City



how to Knurl Bands. Decorative metal bands can be knurled by feeding them between a knurling wheel and a heavy rod chucked in the lathe. Knurl the backing rod to keep the work from slipping under pressure of the knurling wheel. Set the lathe for lowest back-geared spindle speed and guide the band with one hand while the other forces the cross feed forward.— Floyd McGuckin, Ridgewood, N. J.



Lathe Lamp Moves with Tool Bit. This auxiliary lathe lamp rides the tool post and follows the cutting action along the length of the work. It is screwed to a wood block drilled to fit easily over the tool-post tightening bolt. When changing bits, it is lifted off and set aside.



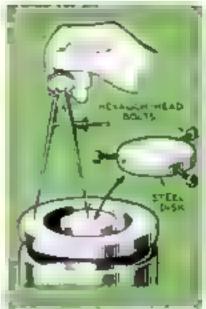
Vise Doubles as Press. For the price of a few pieces of steel channel you can convert a vise into a hand press, and still use the vise as a vise.

Bolt two 18" lengths of channel to the sides of the vise as shown and join the ends with the vise body. Insert shims if this piece is slightly undersize. Some vises have the manufacturer's name cast in the sides; this can be sliced off with a cold chisel and the sides smoothed with a file

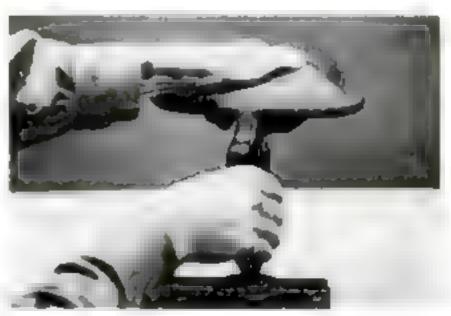
Short work should be backed up with wood blocks to bring it within the range of the vise ram.—Elbert Robberson, Part Washington, N. Y

Mechanical Spider Centers Dividers.

Layout work around a bored hole or a cored casting can really be difficult—you can't support the dividers in a hole. This mechanical spider punched in dead center will support the divider leg and accurately center it in



the bore. Adjusting the three bolts shifts the center to suit the layout. An extra set of long bolts will hold the spider in large openings.—F. Shelford, Los Angeles, Calif.

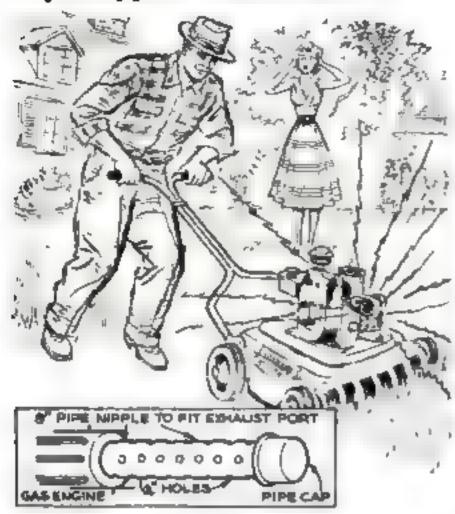


Use Saw Vise as Bending Brake. A saw vise, which has longer jaws than the ordinary bench vise, can be put to use in bending thin sheet metal. It will handle practically any home-shop bending job.



Tape Sets Drill and Tap Depth. Running a tap to the bottom of a blind hole invariably sports the work or breaks the tap. Masking tape wrapped around the drill will show when you've reached the desired depth. Around the tap it will show when you're nearing bottom. Distance should be measured from the beginning of the flutes rather than the point when setting the depth for drilling.

Pipe Nipple Muffles Mower



If a burned-out or rusted muffler is making your power mower sound like a string of firecrackers, you can reduce the racket considerably with a pipe nipple about 8" long, drilled and capped as shown. Four rows of \$" holes spaced about 1" apart will permit the exhaust gases to discharge easily and less noisily.

Bent Cardboard Holds Drills



If you need a drill rack in a hurry, use a prece of cardboard. Fold it in the middle, bend short flanges on the ends, punch holes for the drills in the top of the center fold,

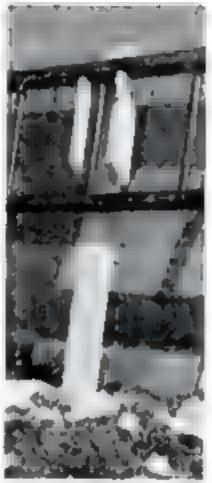
and thumbtack to the wall,-Glen F. Still-well, Manhattan Beach, California.

Rack Will Protect Your Ladder



Your ladder will last longer—and be out of your way—if you store it off the ground.

The ceiling rack above, made by Raymond P. Ghelardi. Cambridge, Mass., has rollers-1" pipe mounted on dowelsat either end so the ladder slides in or out easily. For storage against a wall, Russel S. Dart of Middle Haddam, Conn., uses a stand of 4' two-byfours with short boards nailed on. The ladder hooks over the boards.

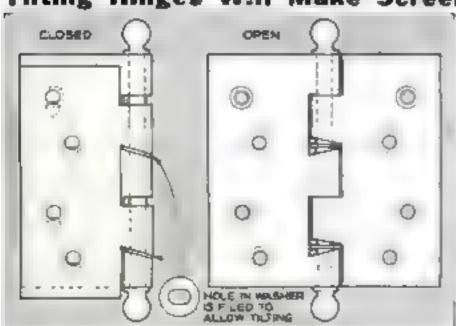


Shellac Guards Sash-Cord Knots

Sasii-cond ends are less likely to fray or slip their knots if you dip them in a can of shellae after tying. The shellae dries quickly enough to allow application of several coats.

-Lewis Booker, Louisville, Ky.

Tilting Hinges Will Make Screen Door Close Itself

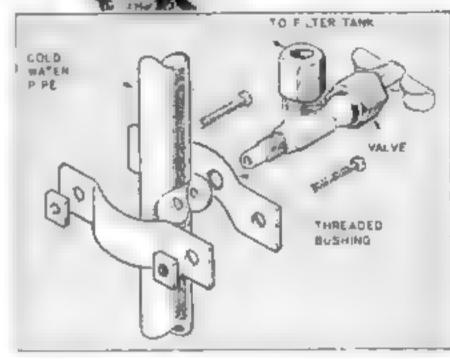


A SCREEN DOOR will gently close itself without a spring—or stay obligingly open part way for awhile—if you use the trick of tilting hinges. The door's own weight then makes it close. Stock hinges are converted by cutting away the two bearing surfaces as shown.

A slope of 1 in 1% is best for light screen doors, but heavy solid doors may need only 1 in 3. To retain oil at the bearing surfaces, washers are needed. Their holes should be filed oval to allow tilting around the pin.—Edward E. Thorp, Montelair, N. J.



You can have purified drinking water on tap by drilling a small hole in the coldwater inlet to your kitchen sink and hooking on this filter tank. The kit includes all pape, fittings and connectors, plus a special spaget that can be mounted anywhere near the sink. After the hole is drilled in the pape, a threaded bushing is clamped over it and a valve screwed into the bushing (right). Then k" tubing is run from the valve to the tank and from the tank to the spigot. The electrochemical purifier is said to remove bad odor or taste, and 99 percent of all bacteria. Wolfer Corp., 3723 Wilshim Bled., Los Angeles.



Sealed Shop Lamp Gives Brighter Light, Can't Corrode

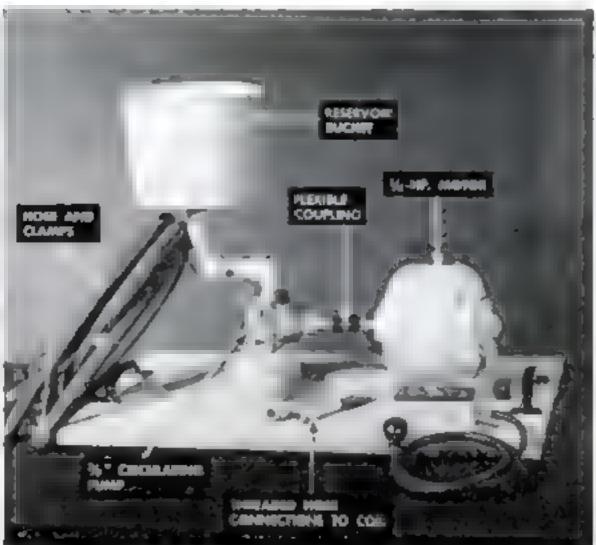


Write this sealed-reflector shop lamp you'll get more light and less dirt. The swivel-joint lamp, made especially for use around power tools, is said to eliminate the grease and grime that collect on ordinary lamps, and rob up to half their output. It comes in three models with various arm arrangements, can be clamped or screw-mounted and takes either a reflector-flood

for broad light or a reflector-spot for close, pinpoint work. Neoprene-rubber sleeves (center above) protect the swivel joints from oil vapors and moisture. Also available is a kit of different-length arms, connectors (right) and reflector hoods, from which you can assemble a variety of conventional lamps. Robboy Electric Mfg. Co., 2062 E. 70 St., Cleveland.



Pump Outfit Cleans Heater Coils



Cons in a tankless water heater can get hardening of the arteries. Lime in hard water builds up inside, cutting both their capacity and heating qualities.

The outfit shown here will probably see service every year if your town has hard water. It circulates a commercial solvent to dissolve the lime.

You use it by shutting off the oil burner and cold-water supply, draining the coils and connecting the pump to the lower end. Hose is then run from the upper end of the coil to the reservoir bucket. Tees can be fitted to the pipes to make the annual hookup easier. A gallon of solvent (about \$3 at plumbing supply houses) is poured

into the bucket, pumped into the coil and allowed to stand about 15 minutes. The solvent is then circulated until it flows from the return hose in a "full-pipe" stream. The hoses can be switched occasionally to reverse the flow of solvent for a more thorough cleaning.

The solvent is then discarded and water and a little detergent circulated through the coil.

Remove the pump connections, hook up and turn on the water and run the burner for about 15 minutes while the heated water runs out a faucet, flushing away the last trace of solvent.—Frank V. Kopec, Wallington, N. I.

Simple Holder Makes Nailing Joist a One-Man Job



In such projects as building a porch or arbor, supporting and nailing the cross members becomes a one-man job with a pair of these holders. With the ends of the beam resting in the holders, you can concentrate on nailing it in place. When the nails have been driven, pull out

SOLT PULLS OUT RESTS THE EN STIMU BEAM!

the bolts to free the holders. The dimensions shown are suited to two-by-sixes.— W. G. Waggoner, Sacramento, Calif.

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Mate to CAPT. EDDIE RICKENBACKER'S 1917 Engine



The colorful career in war and peace of this historic engine—oldest registered with the American Power Boat Association—proves you can't beat proper maintenance. Says Geo. N. Davis of Vine Grove, Ky., owner of "It's A Wonder": "She's as sweet and sassy now as she ever was. And I aim to keep her that way with Champion Spark Plugs. The years don't mean a thing when you keep Champions in a good engine!"

Try a set of dependable Champions soon. You'll never go back to ordinary spark plugs!

CHAMPION SPARK PLUG COMPANY, TOLEDO 1, OHIO

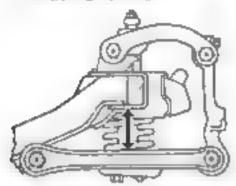


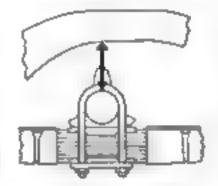


Care and Feeding of Engines 57 5. 7. CORP

HARD STEERING

Hard steering may be caused by (1) improper lubrication, (2) uneven tire pressure, (3) brakes needing adjustment, (4) bent steering knuckle, (5) improper camber or caster, (6) frame bent or out of line, or (7) a sagged spring. Points 1, 3, 4, 5, and 6 will need the help of your dealer. Here is how to check for sagging springs:





FRONT SPRING

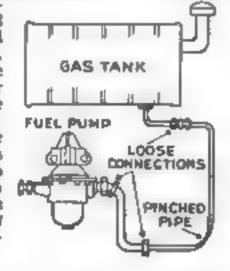
REAR SPRING

Inflate all tires to correct pressure. Make sure nothing in car or trunk causes extra weight on one side. Then check height of each front spring from top of lower control arm to bottom of frame; these should be equal. Then check against a new car, and replace springs if sagged. Check rear springs from bottom of frame to top of rear axle; a difference in readings should be corrected by replacing springs.

HOW TO CHECK FUEL PUMP

One cause of power failure can be lack of fuel due to a leaky or restricted line. Check this by disconnecting

fuel line at carburetor, connecting rubber tube to end of line and placing other end of tube in a quart measure. Have someone start engine and run it at idle speed for 45 seconds—for which there issufficient gas to carburetor Pump should deliver one pint or more. If it delivers less, look for a leak in pump or fuel lines, or a restriction between fuel pump and gas tank. CAUTION; Make test outdoors! Use care with gasolinel



MORE

WRITE FOR FREE BOOKLET

For your free copy of "MORE POWER, Less Gas, Less Oil." a helpful dilustrated manual of car care, just write a card to Sealed Power, Dept H-9, Muskegon, Mich. And for the finest piston rings made, insist on Sealed Power Kromex Ring Sets, with the famous MD-50 Steel Oil Ring, best for oil control even in tapered and out-of-round bores.

Meet Mr. Guided Missile [Continued from page 144]

There was the dramatic incident of the first flight test of the first Regulus. It was a failure and resulted in a total loss of the "bird." A lot of people had seen it fall. Afraid that security precautions would be stripped when no pilot was found at the scene of the crash, an officer quickly rigged a Navy pilot in flight clothes and put a popped parachute in his arms. He was planted in a field of alfalfa, ready to explain to one and all that he had bailed out when the engine of his plane had failed.

The Case of the Stubborn Cow

Another time a stubborn (or, perhaps, subversive, adds Palley) cow refused to budge from the middle of the runway. A pilot made low passes, but the cow ignored them. A jeep did no better, Finally an enterprising sailor rigged up a persuader from a couple of flashlight batteries and some wire. Bossie left in such a cloud of dust that a photo plane flying overhead concluded that a Regulus had been launched.

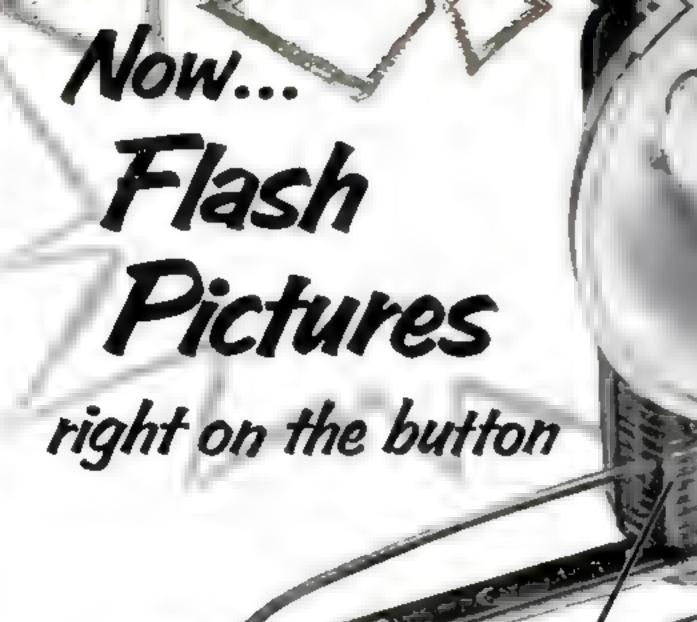
This reminiscing was mostly for my benefit. During his short visits home, Palley is far too busy with his family and hobbies to think much about the missile. Golf (he plays in the middle 70s) and bridge have had to go pretty much by the board. Their place has been taken by building furniture and refinishing antiques, which keep him around the house.

He also builds model cars and airplanes. Four-and-a-half-year-old John already is an avid airplane-model fan.

Although Palley is following the history of aviation in his models, there is a difference. Some of the models young John plays with may be studies for guided missiles to come.

The Changing Times

INDIAN chief introducing himself to a pale-face visitor: "I am Brave Eagle; this is my son, Fighting Bird, and this is my grandson, Super-jet Bomber."—L & N Magazine.



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Positive Sesh operation-Electrical contacts are designed for maximum current flow.

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pack (see below left), \$8.25.

Also available in Standard model without B.C. Uses "C" batteries; accepta B C Flash-



Convert aid flash unit to S-C

Kodak B-C Flashpack replaces two "C" batteries (end to-end type), \$2.95 (battery extra).

Multiple lighting easy (right)

New Kodak Flasholder Extension Unit, Model 1, with Lumaclad reflector has 20-foot cord and connector, exposure table, bulb ejector, Flashguard, Use up to 2 units with Kodak Flasholders for special lighting, \$11.

Eastman Kodak Company, Rochester 4, N. Y.

50% more illumination and greater camera range with new Lumaclad reflector

Pictures at greater distances-Extrabright, mirror-surface reflector makes correct exposure easier to obtain

Even Muminution-Extra-deep, tarnishproof, dent proof, Tenite reflector assures even lighting without "hot spots."

See your Kodak denier for wide choice of inexpensive Flasholders for most Kodak and Brownie Cameras.

> Prices are subject to change without notice



Biggest Engineering School

[Continued from page 159]

live and work in Greater Chicago. The rest are widely scattered.

There is a picturesque and true story that Armour Tech began with a sermon. Rev. Frank Gunsaulus, noted for oratory sprinkled with five-syllable words, preached one morning in the Nineties on what he would do about young Chicago's education if he had a million dollars. After the sermon, Philip D. Armour, who had been greatly moved by the vision, stepped up and offered him the means to practice what he preached.

Thus Armour Tech came into being, and in the course of years the Armours' contributions to it greatly exceeded the founding gift.

Lewis Brought a \$2,000,000 Dowry

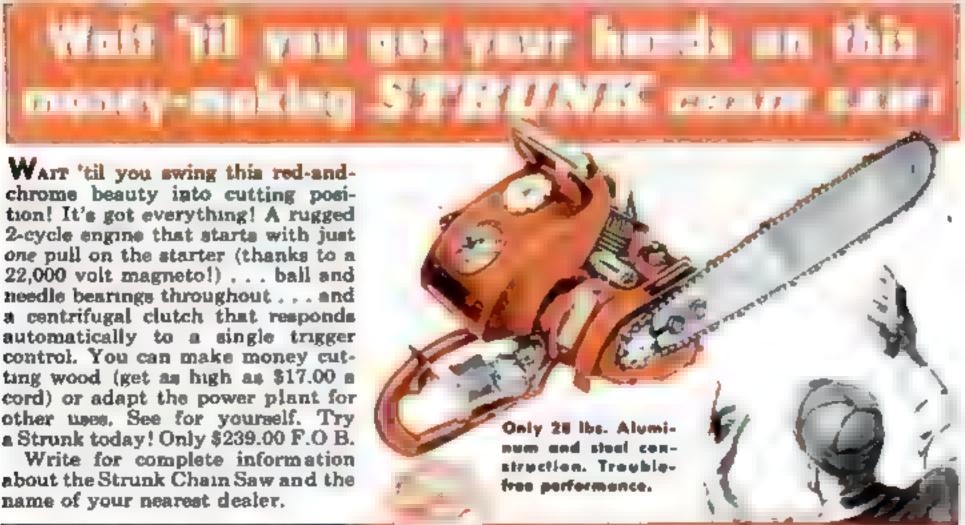
Lewis Institute, the other parent of Illmois Tech, was also established in the Ninetics. It sprang from the dreams of a frail young man who had pushed westward from a little town in Connecticut and made a fortune in Midwestern real estate before he died, in 1877. It was 1895 before the money he left had grown sufficiently to found the technical school that the terms of his will dictated.

When Armour Tech and Lewis Institute merged to form Illinois Tech, Lewis brought a dowry of around \$2,000,000 to form a common endowment with Armour's remaining few thousands. This left a lingering suspicion in the minds of many stalwart Lewis alumni that the union had been largely a marriage of convenience. However, they cannot help taking pride in the spectacular growth of the only child.

The World Today

Doubtrutter the young mother examined a toy, "Isn't this rather complicated for a small child?" she asked.

The clerk replied, "It's an educational toy, mathim, designed to adjust a child to live in the world of today. Any way he puts it together, it's wrong,"—Housest area Review



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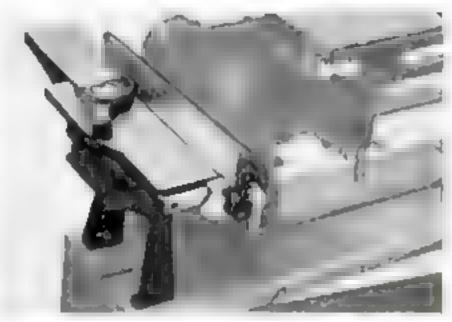
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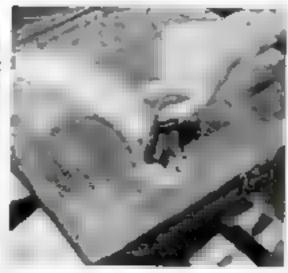
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broken corners, fill meks and holes. A powder-form plastic putty, Savogran Wood Putty, is ideal for this. You can form it, tool it and it doesn't shrink. For cracks in plaster, use Savogran Crack Filler, It's the original patented quick-hardening water putty

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250 POPULAR SCIENCE

Gus Saves the Old Homestead [Continued from page 1981

Billy Ryan ran for his patrol car, pulled up beside Gus and waved him in.

"We'll follow him up the grade," he said.
"and stand by till that load breaks free."

For a quarter of a mile they trailed at a safe distance. Then the road was leveling. Just ahead was a broad, clear space where Berry could pull off to the side. Even if the poles let go, now, they wouldn't tumble down the mountain. Another 100 feet—50-20-10.

The truck ground to a stop.

Cables Lash Out in Arcs of Fury

Berry climbed out of the cab, graning. That grin stayed with him even when the cables gave a sudden hitch, twanged, and lashed out in twin arcs of fury. With a deafening roar, the poles rumbled to the ground.

Billy Ryan whistled.

"That," he said, "was luck."

Berry shook his head,

"Aren't you forgetting Mr. Wilson? Say, what was causing all the trouble, anyhow?"

Cus handed him the ceramic filter.

"You're kidding!"

"No. That little gadget was blocking the flow of gas. When you gunned the engine and it didn't quit, it suddenly came to me. That filter is so old that all of the impurities it had trapped finally plugged up most of its microscopic holes. What little fuel did get through to the carburetor was only enough to let the engine idle."

Berry was still incredulous.

"I've never heard the like. Say, would you fellows do me one more favor? I'd like to get a call through to the company, so they'll send some equipment up to put those poles back on the truck."

"Will do," Billy promised. "Are you

ready to go, Gus?"

As the patrol car spiraled smoothly down East Mountain, Ryan cocked an eye at his nodding companion.

"Sure was a pretty sunrise!"

END

Meter Miser

IN THE Alps, McAndrew hired a taxi at the station to get to his hotel. On the way the taxi skidded downhill and the driver yelled, "My brakes are gone. I can't stop the carl"

McAndrew, very excited, replied, "At any rate, mon, stop the meterl"—The Right Hand.



RONNEY PORCE & TOOL WORKS . ALLENTOWN . PENNSYLVANIA

African Railroad to Tap Treasures

[Continued from page 152]

nually to deep-water Atlantic seaports.

The first of these "wrong-way Corrigans" follows the old Portuguese slave route across the southern Congo and Angola to Benguela, 500 miles down the coast from Matadi. This Bas Congo-Katanga, Benguela could be called the Duluth, Mesabi & Iron Range Railway of Africa

It is a "git-thar-fustest-with-the-mostest," heavy-duty pike that carries everything from industrial diamonds to titanum, behind what are among the strangest and most powerful locomotives ever seen outside the United States. Set the running gears of two American steam locomotives far enough apart to form a pair of enormous car trucks. Then pivot a boiler and firebox between them, and place a water tank out front and a coal hopper over the rear truck. That gives you a rough idea of the "Garratt"-type locomotive—a design which has only one drawback. When the engine uses up the greater part of its fuel and water, the wheels begin to slip.

The Leopoldville-Katanga-Dilolo Railway, second fork of the Belgian extension, made a feeble attempt to plod on toward Cairo. But the temptation to turn a fast franc was too great. So this line also heads for the Atlantic, winding up at Port Francqui, 525 miles from Leopoldville by the Kasai and Congo Rivers.

At this point the bits and pieces begin to add up. Lay trackage between Port Francqui and Leopoldville, as the Belgians intend to do, and you trim two weeks from the time now spent transferring freight from trains to steamboats and back to trains. You also have a through line which lops 300 miles from the present rail-sea route between Katanga and North Atlantic ports. And you have a fine alternate route to the south—the Bas Congo-Katanga, Benguela.

This Leopoldville-Katanga-Dilolo ex-

[Continued on page 254]



PROVED by Unbiased Road Tests

CYLINDER WEAR CUT 49% with Miracle Power



You can't argue with facts. Wetmore Hodges & Associates, independent laboratory, road tested two engines—one with Miracle Power, one without.

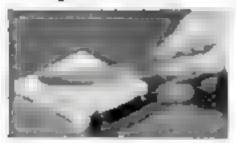
One of many benefits of Miracle Power proved by this test is its capacity to lubricase upper cylinders. Oil alone won't lubricate here because temperatures may reach up to 1400° and oil burns at 550°. But Miracle Power, a blend of petroleum

super lubricants including colloidal synthetic graphite in suspension, withstands far greater heat. That's why the Miracle Power test engine bad only half as much bore wear as the engine without Miracle Power.

Other results: After 33,703 miles, the Miracle Power angine was using 33%, less oil, had 13% more compression, 56%, more plug life, 15% less ring wear.

Use Miracle Power in your gas and oil-accept no substitutes.

Stops DRY STARTING Damage . . . Treats the Engine, Not the Oil!



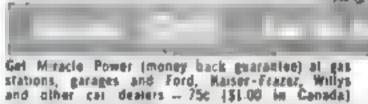
METAL ABSORDS MIRACLE POWER AS DREAD ADSORDS INTTER—Miracle Power fills microscopic valleys in metal with a breathlike graphoid film. This film holds oil preventing Dry Starting damage (metal to metal contact during the up to five minutes it takes to pump oil to vital parts after starting). It also lubricates when the oil film breaks or burns off.

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The AP Parts Corp., 1953



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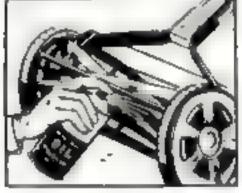
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African Railroad to Tap Treasures [Continued from page 252]

tension has already been surveyed, and construction should begin in 1954.

The Upper Congo-Great African Lakes Railway, the Congo's final contribution to the trans-African project, is a little meter-gauge pike on which you can charter a private car built by native carpenters of African hardwoods, varnished and hand-rubbed, inside and out, and equipped with brass bedsteads and a bathtub. The line's 50 wood-burning locomotives, 475 freight wagons and 35 passenger cars are hardly long enough to carry the impressive title "Compagnie des Chemins de Fer du Congo Supérieur aux Grands Lacs Africains," But their pygmy size is no clue to the bull-elephant job turned in by this Upper Congo-Great African Lakes. It is a baby Pere Marquette-a combination railroad and steamship line which wrestles the hides, grain, cotton, copal and lumber of the upper Congo down to Albertville, then ferries them 80 miles across an equatorial puddle that is longer than Lake Michigan and deeper than Superior. This is Lake Tanganyika, where Henry Stanley tipped his pith helmet to Dr. David Livingstone in 1871.

Both gentlemen would be surprised today, to find a bustling east-shore port within a javelin's throw of the point where they met. Here, at Kigoma, the Grands Lacs dumps a half million tons of traffic annually into the laps of the British.

Today, the Upper Congo-Great African Lakes is being widened to the 3 ft. 6 in. gauge of the railroads to the west, and the termite-proof steel ties of an extension are already being pushed across 200 miles of comparatively open country to a link with the Leopoldville-Katanga-Dilolo Railway at Kamma.

The Tanganyika Railway, built by the Germans but now in British hands, would fit in neatly. When German East Africa fell into British hands after World War I, the undeclared dividend was this 773-mile-long, meter-gauge line, which

[Continued on page 256]



Handsome walls of Temlok Plank go up quickly, easily



"Lok-Bevel" joint on Temlok Tile speeds application

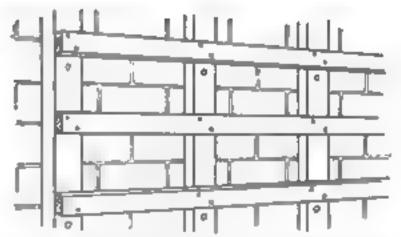
IT'S EASY TO FINISH YOUR BASEMENT WITH TEMLOK

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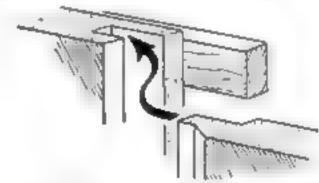
What's more, you don't have to paint Temlok. It comes already finished with two coats of good-looking, durable paint. Temlok is a wood fiber insulation board. It will help keep your basement comfortable.

Temlok Plank for walls is made in a handsome "Suntan Blend", in 8", 12", and 16" widths, and up to 12' lengths. Ceiling tiles come in White or Light Ivory, either plain or perforated. Sizes are 12"x12", 16" x16", and 16"x32".

Ask your local lumber or building supply dealer to show you samples of Temlok and help you with your plans. For free booklet, "New Ways to Remodel Your Home," write Armstrong Cork Company, 3709 Washington Avenue, Lancaster, Pa.



Anchor wide flat side of 2"x4" studs against the foundation, two feet apart. Nail 1"x3" furring strips 12" apart over stude and finish with Temlok Plank. Cross-furring behind Temlok provides air circulation. Small vents at top and bottom carry off basement moisture.



This special joint on Armstrong's Temlok Tile and Plank provides a wide nailing flange and speeds installation. Naitheads and staples are concealed by the adjoining piece of material.

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African Railroad to Tap Treasures [Continued from page 254]

had been pushed across the colony from Dar es Salaam on the Indian Ocean to Kigoma, It would be an easy matter to widen the rails, and to link the ports on the west and east shores of Lake Tanganyika with modern car ferries.

The Tanganyika Railway comes down to the sea some 200 miles south of Mombasa and Mackinnon Road, Dar es Salaam and Mombasa could be linked

with a coastal railway.

The Kenya-Uganda Railway stands ready to offer an alternate solution to the problem. This 50-year-old, British-built line runs northeastward out of Mombasa through Mackinnon Road, and on to Lake Victoria. Along its right-of-way, you can still see the ruins of ironsheathed huts that once protected track gangs from the arrows of the Nandis.

Take an 80-mile branch of this Kenya-Uganda Railway, which heads directly west from Mackinnon Road, and extend it 600 miles around the head of Lake Tanganvika to the Upper Congo-Great African Lakes Railway, That would give you a trans-African line which not only shortens the rail distance to Mombasa. but chminates the 90-mile boat trip across Lake Tanganyika.

Whether the British build this Kenya-Uganda railway extension, or settle for a broadened Tanganyika Railway, experts agree that Africa will have her first trans-

continental line by 1958.

Abraham Lincoln once said that it was the misfortune of the United States that politically her railroads should have been laid from north to south. whereas economics forced them to run east and west

Africa is faced with no such problem. Politically and economically, the trans-African railway must link the west and the east. END

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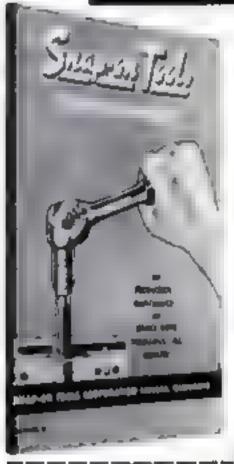
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758 POPULAR SCIENCE

"Barnes Dance" Cuts Traffic Toli [Continued from page 102]

and operated the light by hand for 45 minutes in sub-zero weather. The repairman happened to be away up in north Denver.

"I felt like the boy with his finger in the dike," he says. "Only, it was my ear that was suffering."

Barnes is an eminently reasonable man and he has a dependable sense of humor. He would surely have grinned if he had heard the disparaging remark the airport bus driver made about one of his midblock signal lights.

Barnes Explains Signal

"There's a very good reason for that," he unquestionably would have said, "and here it is."

He would then have explained that along a through street, stop signs are adequate to control traffic at intersections only as long as there aren't many cars traveling on the main thoroughfare. Once the through traffic steps up to peak volume, there is a tendency for the drivers in it to forget about the fellows behind the stop signs. Unless a gap is created every so often, the cars on the intersecting streets have a rough time crossing or entering the main artery.

These gaps can be opened up by placing four signal lights at the intersections. But Barnes figured that he could accomplish the same result by hanging a single light occasionally in mid-block. A single overhead signal light costs about \$300. Four two-way signal lights on posts cost around \$1,500. By choosing the simpler, if unorthodox, way of handling the situation. Barnes was able to buy five times as much traffic control for his money.

Even the airport bus driver would have approved of that. END

Right of Way

Policeman (after collision): "You saw this lady driving toward you. Why didn't you give her half the road?"

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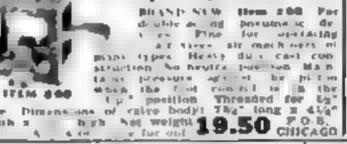
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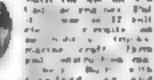


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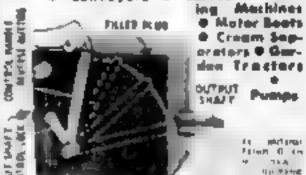
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In a recent series of an-the-site ripping tests comparing leading 7-inch saws, Parter-Cable's new "Contractor's Special" turned in this amazing speed records

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Regardless of the depth of cut or type of wood used, the new "Contractor's Special" in every instance finished the cut for faster than any of the other saws tested! For example, on 34" Fir Plywood, the "Contractor's Special" everaged 7.5 seconds per 8-foot cut!

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Detroit's Newest Basket of Gears

[Continued from page 119]

horsepower boost rumored for Chrysler in 1954.

L on the quadrant does give a lot more downhill braking than Drive, of course, and the lever can be popped over at any speed up to 65 m p.h. (Nothing really hideous will happen if you move it over above that speed; it's just that the reversal forces set up are a bit rough on the works at very high speeds.)

You Can't Count on Engine Drag

There is some foot-off engine braking with the lever in Drive. But as on all torque-converter jobs, there is less than you'd like. You don't go gliding into trouble with the same carefree velocity that free-wheeling used to provide—but you can't count much on engine drag.

Unless you are a speed-shift wizard or drive non-stock equipment, the A323 Chryslers are going to get the jump on you at the light. About the only U.S. stock cars that will consistently stay with them are the Series 62 Caddies. If you time these two cars with equal proficiency, put them side by side, and floor-board them, they'll stay remarkably close. The Hydra-Matic Caddy will generally lead by a few feet at 25 or 30 m.p.h., the A323 Chrysler by a few feet at 60 m.p.h. What this does to the gas and tire bills shouldn't happen to the U.S. Treasury, but getaway helps sell cars.

How It Compares with Other Automatics

A323 has some relatives on the road, in principles if not in details, Fordomatic and Mercomatic are perhaps the closest. They differ chiefly in offering a quadrant-selected low-to-second (Low) or second-to-high (Drive) range in place of A323's single medium-to-high range. Studebaker's and Packard's automatics are also similar, though they have a lock-up or direct-drive gizmo that Chrysler passed up. Powerglide and Dynaflow also have some similarities to A323. Only Hydra-Matic, an automatic four-speed box without converter, is fundamentally different.

[Continued on page 262]



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saw blade. It is especially well suited to delicate fret saw work and it always cuts that smooth edge that requires no sanding. This last feature alone will save you many hours of time which you would ordinarily spend sanding such things as what-not shelves, magazine racks, fern stands and the many other things that you will like to make.

You will find that all the forests of the world are right at your elbow to proterials for your handscraft. But even with that you are not limited to wood, Plastic materials are now appearing in a large variety of coars



For instance catalin, a moided plastic, It is comparatively easy to work on this lig saw and takes a beautiful polish, dot quite so easy to work, how-ever, as bakelite, Bakelite, for a cast plastic, is hard and brittle and the ordinary saw cuts kind of a splintered or split edge on it. But the high speed

and the fine teeth in these Synero I indea always insure a clean cut. You will find that these various plas-tic materials are particularly nice for working out such things as monogram pins, bolt buckles, picture

frames and wall lamps Now comes the best news of all. Parents especially are glad to know that here is a power jig saw that is sufe also for boys and girls to use. Accordental injuries on this machine, even the slightest cuts, are very rare Serious injuries are impossible. Now that may seem atrange to you but the reason is very simple ... the Syncro blade does not "pull" the work or finger towards it as belt-



driven jig saw bindes do

If you happen to have seen a Boy Scout Troop doing hands aft metal work, you will always find a jig saw one of their main tools. Perhaps you have various ideas that you would like to work out in metal; a name plate out of aluminum a shadow lamp out of copper, or book ends out of brass. do all these things on this game machine

using the same one blade to cut all those diff rent types of nietal as well as wood cardboard etc.
And temember that you can do all
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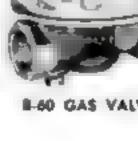
This scientific phenomenon is literally true. When two dissimilar metals are joined together at one end, and that end is heated, a measurable electric current is produced. This is the thermocouple principle; its use means much in gas heated homes.

In the General Controls B-60 self-powered gas control system the pilot generator amplifies this thermocouple principle into sufficient power to operate the onoff gas valve and the automatic room thermostat. To hundreds of thousands of home owners this General Controls system means accurate, dependable heat control of their home, automatically, without dependence on outside power sources. The system is whisper-silent and absolutely safe. The handsome room thermostat maintains room temperatures that are just right for your family.

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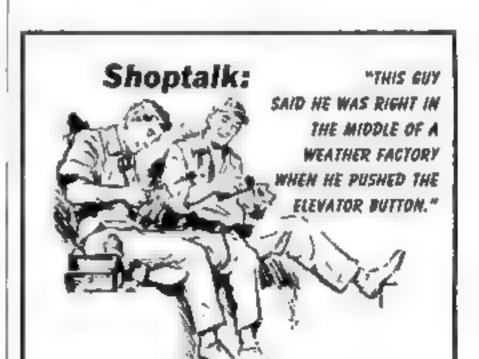
Detroit's Newest Basket of Gears [Continued from page 260]

Chrysler claims that it pondered long and experimented hard before it froze A323. Lock-up into direct drive, for example, was discarded only after considerable study, partly because it added weight, complexity and cost, partly because it "flattened out" car performance at medium speeds, where an unlocked converter can give extra perk to a car. In A323 the converter will "couple"—come within a few percentage points of being locked—at light throttle at 30 or 35 m.p.h. But when you feed the engine more gas, the converter will unbutton and multiply torque, the amount in proportion to what you demand. At 50 and above she couples even at full throttle.

A323 has been in development for eight years, and except for tooling and production headaches might have been in the salesrooms last winter. Chrysler says that the reason it has been slow to bring out a fully automatic drive is that the company wanted to make it a really good one. This is probably accurate, certainly A323 bears marks of intensive engineering.

Whatever the history, Chrysler's in business with an impressive new drive.

-Frank Rowsome Ir.



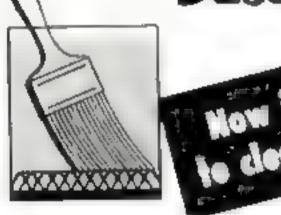
The speaker is a mechanic at an Air Force Base. He is telling about a pilot who was in the center of a thunderstorm (weather factory) when he bailed out by using the ejector-seat release (pushed the elevator button).

Where do they work? Answer below.

What are they talking about?



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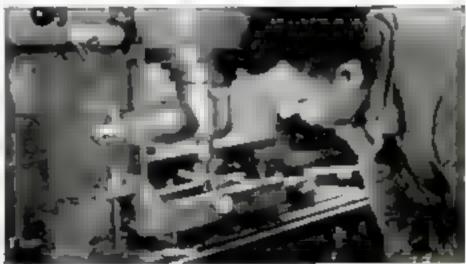
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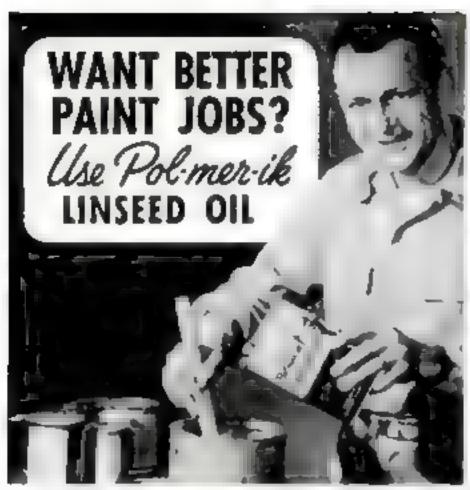
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They Sink Fortunes in Auto Tests

[Continued from page 130]

administrative staff and an analyticalreport section. Fit out and staff a machine shop, instrument shop and electronics shop. Build up 24-hour medical and police details. And now you are about ready to start testing cars on the Detroit scale.

What Do They Do?

Proving-ground duties vary a bit, but generally the work divides up this way:

1) endurance runs of current cars, both your own and competition's; 2) intensive wringing-out of next year's models; 3) testing of engines and parts ticketed for production several years into the future; and 4) running special checks for groups within the company like Transmissions or Styling.

Tucked into this general framework are extra jobs too. These may involve spot checking the manufacturing division; doping out how the competition saved a buck; helping the service department run down a bug; feeding useful tips to Sales; impressing visiting V.I.Ps.

But the main business of a proving ground is the production of reports—handsome documents with multicolored graphs that are sent out to limited lists of people within the company. These reports are bandled with the ritual accorded bombsight blueprints; only a few dozen are printed and numbered copies are delivered by messenger, with return receipt requested. This writer, delighted with an impressive GM report that analyzed getaway performance of all U. S. cars, asked a proving-ground engineer how he could obtain a copy.

"The best way I know," the engineer remarked, "is to grab this one and shoot your way out of the gate."

Next month: What do proving grounds really prove? How come they occasionally muff one? What accounts for "lemons"?

How True

Most people won't drive a car that looks old enough to be paid for.—Indiana Tele News

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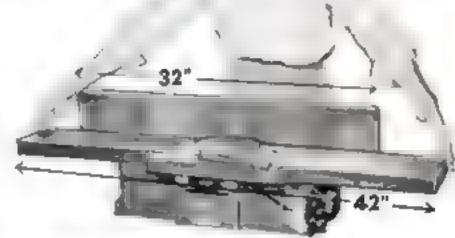
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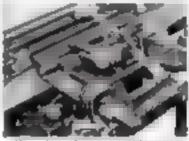


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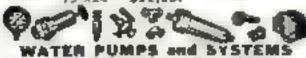
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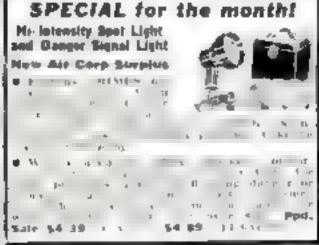
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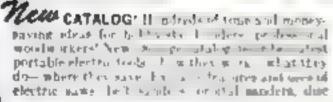
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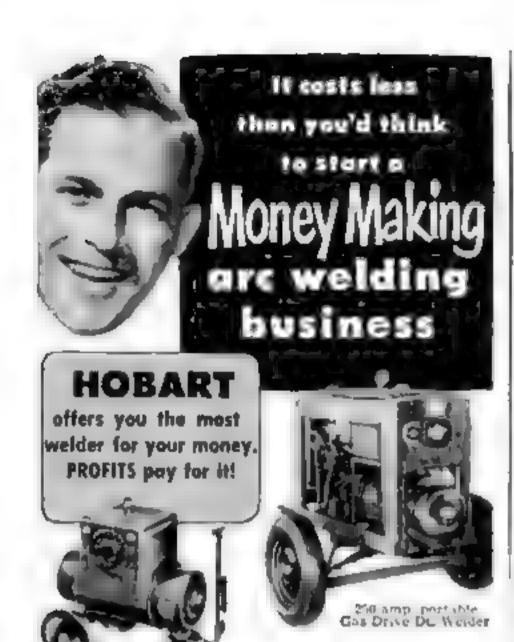
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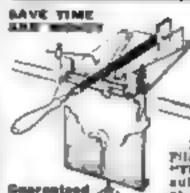
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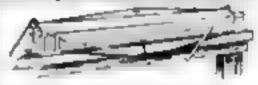


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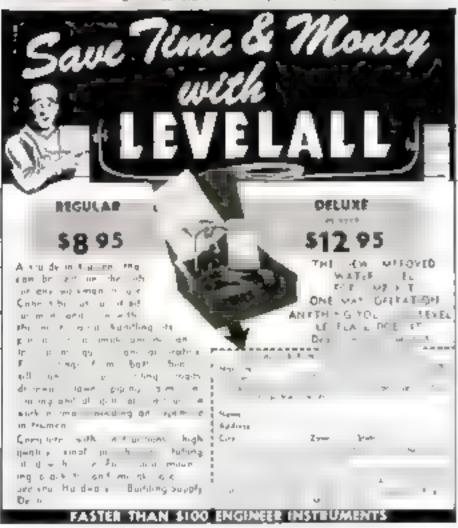
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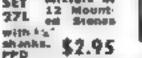
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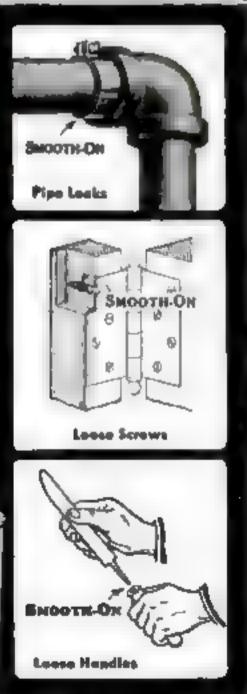
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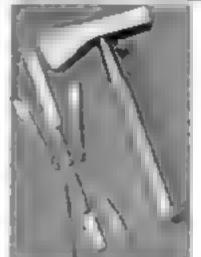
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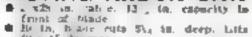


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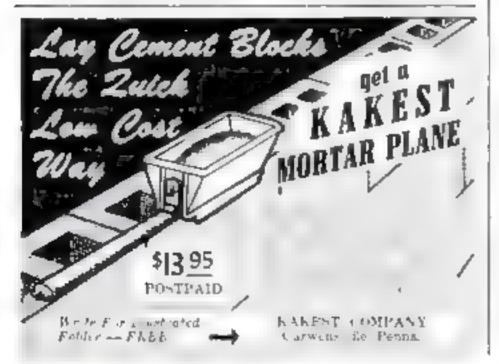
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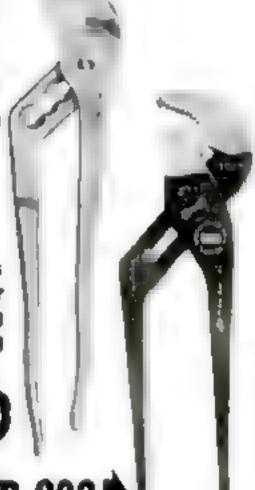
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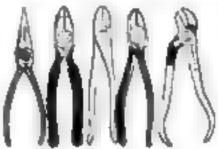
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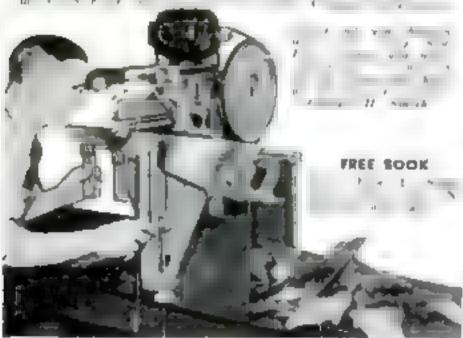
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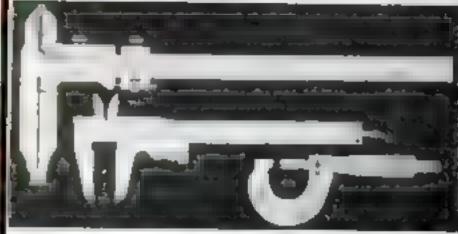
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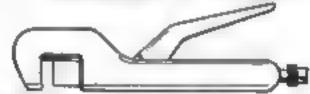
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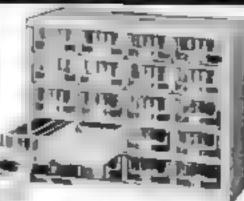
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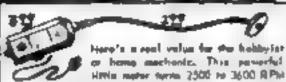


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When we added that we had named it the Lifetime Battery because of its life (meaning exceptional power) and the time it would last (3 to 4 times as long as ordinary batteries), and that we guaranteed it for six years, these editors were understandably doubtful, to put it mildly. One publisher, in fact, refused to accept advertising for this battery until what he then considered to be our extreme claims were carefully tested.

One of the editors said. "Let us test this bettery, any way we see fit. If it does what you claim, it's news our readers will be interested in. If it's no good, our readers will be interested in that, too, and that's the way we'll write the story." We said "go ahead" and they took a standard Lifetime Battery off the production line and went to work

You may have read the result of the first test in a famous automotive magazine (name on request). Using two well-known betteries (possibly the best-known high-quality batteries in the world) for comparison, they first run the Lifetime Battery down completely and let it re-charge itself automatically. They repeated this test 43 times the first day, then compared its strength with the other two batteries. Results the Lifetime Battery was 2045 stronger than the strongest of the other two batteries. They ducharged the Lifetime Buttery another 20 times, allowing it to re-charge itself automatically each time, and compared all botteries again the Lifetime Battery was now 2135 stronger than one battery, 2215 stronger than the other! Next, they put a punishing 300-amp load on the Lifetime Battery, it survived that in good shape. So they repeated the selfrecharging test again and finally concluded: "... unprecedented life expectancy . . . remarkable recuperative characteristics . . . outperformed the others in every respect and by a comfortable margin. ... an outstanding value

Still another editor wrote. "... definite battery improvement greater recuperative power, greater initial output... obviously high quality."

During ladependent tests in Aleske and the U.S., the Lifetime Battery was intentionally discharged under sub-freezing conditions, recharged itself automatically & started car at eace!



Engineered for Cold Climates

Soon after the Lifetime Battery went into production, we selected a few dealers in northern U.S. and Alaska, shipped them a few batteries and waited to see how the dealers and the public would react. Our Alaska dealer told us that before presenting it to his customers, he was going to give the battery an Arctic test: discharge it completely then freeza it at 30 below zero for 72 hours. Result the battery had recharged itself and immediately started the car Immediately we received a telegraphed order from Alaska for \$6,043 worth of Lifetime Batteries!

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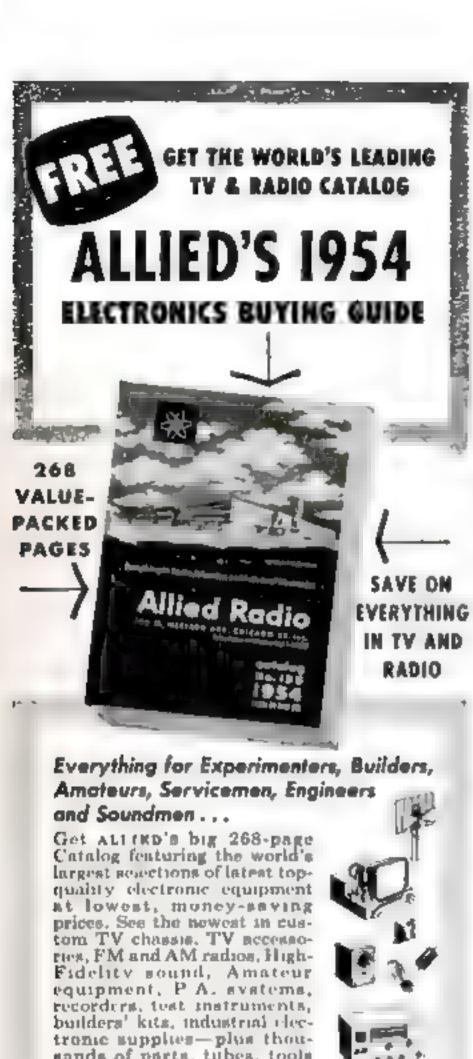
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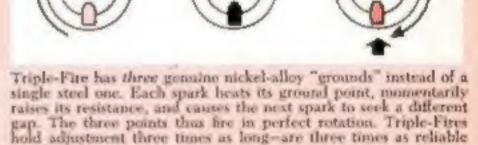
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Little Hurricane Knocks Out Big One

[Continued from page 168]

200-mile winds certain to follow. Within a few hours the killer hurricane would beat Bermuda to death, it appeared.

But at the same hour, five in the morning, Fox caught up with Easy. The chase that had begun 4,000 miles away ended

at Bermuda's doorstep.

Like a boxer rushing in with a surprise blow Fox knocked Easy off its course. Their winds meshed and the two hurricanes were locked, but they did not become one as people had feared. Instead, they roared, whirled and circled in a fantastic dance. Then Fox sped away toward the northeast, and Easy veered off in a wide arc. When last seen by watchers on the island both hurricanes were moving at high speed along separate routes out into the Atlantic.

Rescue Seemed Miraculous

One hurricane had saved Bermuda from the fury of another. The timing had been incredibly close. In a matter of minutes Bermuda would have been struck by the heaviest force that nature had ever manufactured out of air and hurled against man. It is understandable - that those who prayed believed that their prayers had been answered.

As to Easy and Fox, they soon reached regions where the air was cool and no longer furnished enough heat and humidity to keep them going. Their winds abated; their torrential rains died down to a drizzle. Days later there was nothing left of them but a few patches of clouds, a few swells on the surface of the ocean.

Right on Time

Sylvia: "When I applied for a job the manager had the nerve to ask me if my punctuation was good."

Mildred: "What did you tell him?"

Sylvia: "I said that I'd never been late for work in my life."—The Kablegram.

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used, shaping is easier.

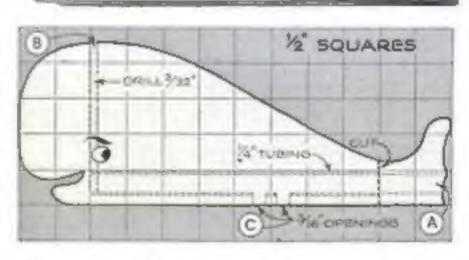
Drill a %" hole 2" deep in the wood at one end, as shown at A. Cut off a 1" slice, which later forms the tail. Enlarge the %" hole in the larger piece to a close fit for a 4" length of %"-inside-diameter plastic tubing. Force the tubing into the hole. If it fits loosely, secure with waterproof cement. With the tubing in place, drill a 3/32" hole from the top, as at B, so that it pierces the tubing in the block at its extreme end. Drill two 3/16" openings, in line with each other, through wood and tubing, as at C.

Secure a "" plastic rod in the tail piece so that it protrudes 4" from the forward end. The rod must slide freely but not loosely in

the tubing in the body.

Insert the rod in the tubing, aligning the two pieces of wood exactly. Now cut out the whale with a jigsaw. To make it float upright, and to keep tube and rod below

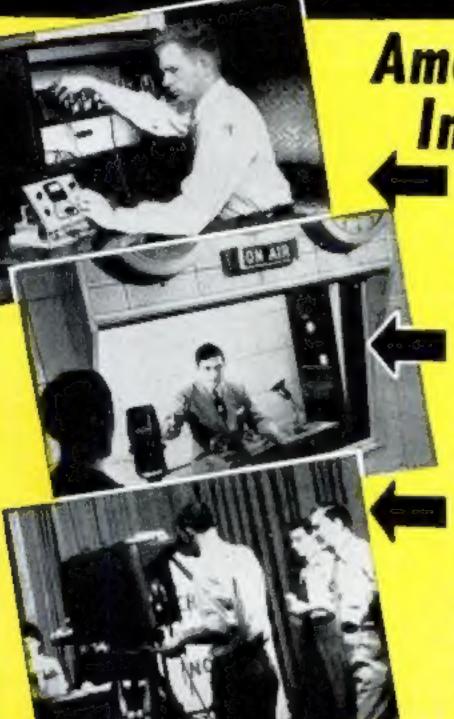




the water line, cement or screw a 1-oz. weight to the bottom of the whale. Finish the toy with a good grade of glossy enamel.

-S. Spitzer, New York City.

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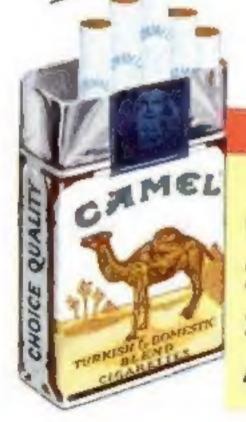
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